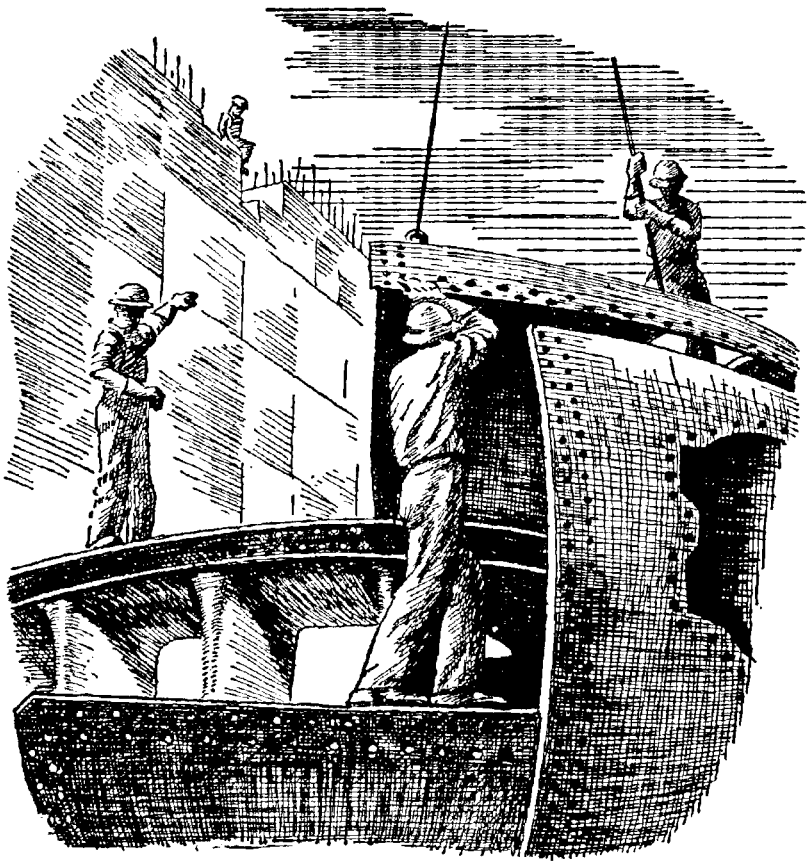
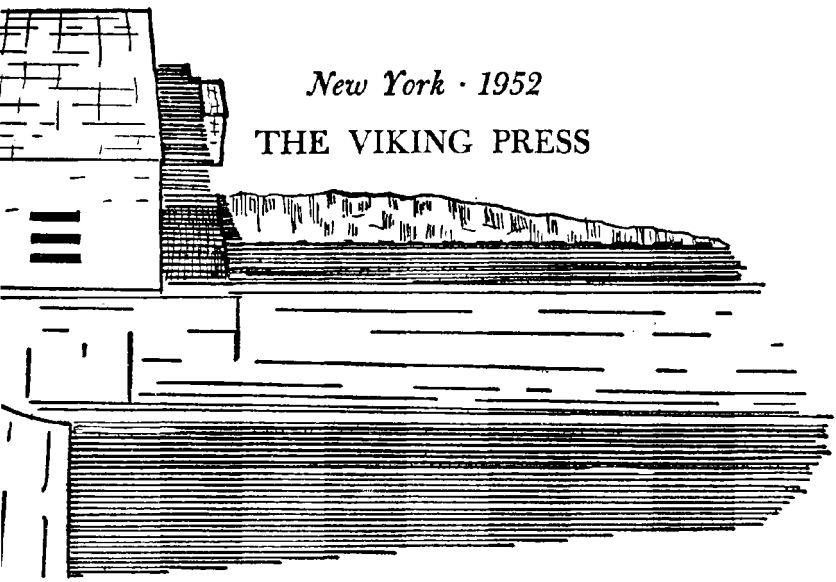
ALL DOWN THE VALLEY



ALL DOWN THE VALLEY

Written and Illustrated by

HENRY BILLINGS



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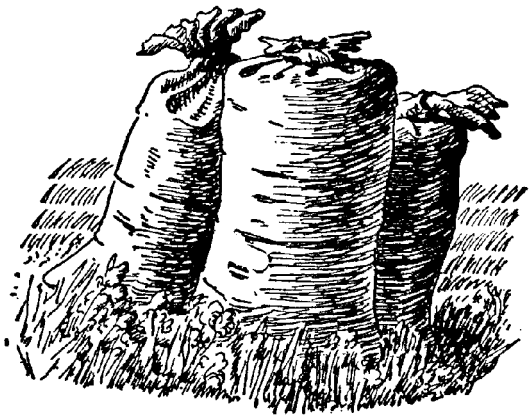

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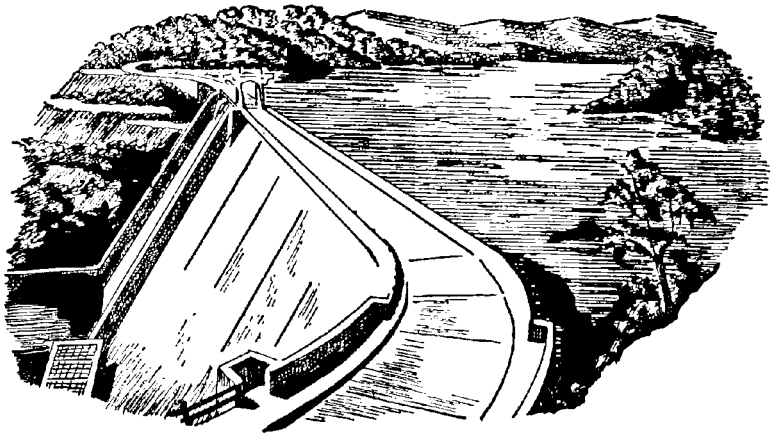


Foreword

"For the economic and social well-being of the people. . . ."

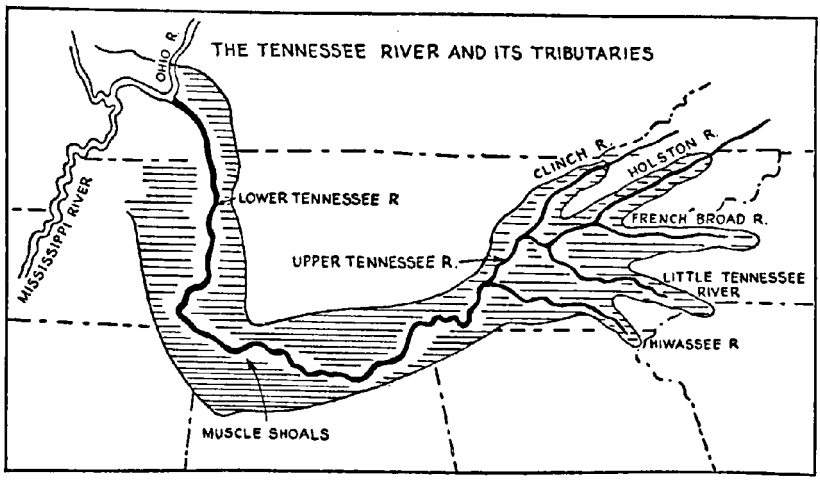
This is a book about water and people. In some ways they are alike. They both resist change, and to alter their course, without knowledge and understanding, is dangerous. Water can be used to generate power for useful ends, or, if neglected, it can cause great damage. People can either join together in seeking their own good, or separately destroy one another.

In the last twenty years both the water and the people within the Tennessee River Valley have changed. The Tennessee Valley Authority has turned that river into a chain of lakes 630 miles long that offers a 9-foot channel for navigation. The flood-control system, which relies on the storage reservoirs in the mountains and the high dams on the main river, can in large measure regulate the 60 billion (average) tons of water that annually flow down the watershed as easily as filling or emptying a bathtub. Each ton of water, on its journey from

the Appalachians to the Ohio River, contributes its weight a dozen times to spin the hydroelectric generators stationed all down the valley. These generators supply 16 billion kilowatt hours of electric power a year to more than a million consumers.

It is this vast hydrologic system, with its dams and locks, floodgates and spillways, turbines and generators, that has altered and controlled the flow of water in that region. But there are other changes. What has happened to the people living in the Tennessee Valley? To answer this requires a better understanding of how people and water can work together to each other's mutual benefit; how natural resources can be brought into balance with human resources. This book attempts to tell the story of how this is being done in the Tennessee Valley.

And so, like the man with a camera who wants to take in the full view, we must move farther back, not in distance but in time, in order to understand the changes that have taken place.



I: The Valley of the Tennessee River

Where Is "the Valley"?

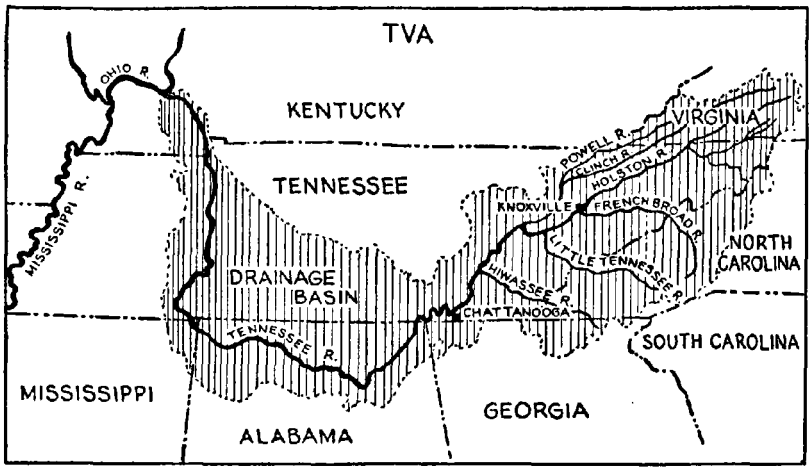
OUR familiarity with the map of the United States often breeds confusion. We see it in our mind's eye and think we know the jigsaw puzzle of states and rivers, until we take the trouble to look carefully at the particular area on the map that concerns us. The fact that the Tennessee River rises in Virginia and North Carolina, flows southwest into Alabama, and then, turning north, flows up the map into Kentucky, may be just another geographical detail to some, but for the purposes of this book it is a basic matter.

The drawing of the arm and hand may help you to visualize the general shape and course of the river. The fingers represent the five large tributaries, the forearm is the upper Tennessee, the elbow is Muscle Shoals, the upper arm is (in contradiction) the lower Tennessee, and the shoulder forms the last

curve as the river empties into the Ohio and the Ohio later joins the Mississippi. The thumb and forefinger (Clinch and Holston Rivers) probe up into the valleys of the Unaka, Iron, and Blue Ridge Mountains of southwestern Virginia. The two middle fingers (the French Broad and Little Tennessee Rivers) touch the Great Smokies in North Carolina, while the little finger (Hiwassee River) reaches through the southern Appalachians into Georgia.

In comparison with other river systems of the United States, there is nothing particularly unusual in the size or length of the Tennessee River. More than anything, it is remarkable for the course that it takes, flowing as far south as it does north, and thus passing through a wide variety of country. The high valleys of the Blue Ridge and Appalachians in which the river rises remind one more of the north than the south. These mountain ranges are heavily timbered with hardwoods and hemlock, sheltering a thick undergrowth of laurel and rhododendron, and the little isolated farms and settlements have the hard-bitten quality of New England. Where the tributaries enter the main river, the open countryside resembles the rolling dairy country of New York state or Pennsylvania. Farther downstream, below Chattanooga, the Tennessee winds through the narrow, rocky valleys that form the foothills of the Cumberland Plateau. Here again the landscape takes on a rugged northern appearance, though only a few miles from the Alabama state line.

As the river flows southward into Alabama the mountains disappear and on each side the wide cotton fields stretch away to the flat horizon. At Muscle Shoals, before Wilson Dam was built, the river dropped more than 100 feet in 30 miles and then, turning northward, cut back across the state of Tennessee into Kentucky. From the Shoals on, the 250 miles to the Ohio is known as the lower Tennessee—a typical southern river gliding through cypress swamps and canebrakes.



The Tennessee River and its tributaries flow across seven state lines. If, for example, we follow the Hiwassee tributary up to one of its sources on a mountainside in Georgia, we would cross three state lines (Tennessee, North Carolina, Georgia). Unlike the state lines, which are man-made and usually arbitrary, this particular mountain represents one of nature's true land divisions. All the water on the Hiwassee side flows into the Tennessee, while on the opposite side the brooks and streams join the Chattahoochee on its journey to the Atlantic. The dividing ridge of that mountain is part of the natural boundary of the drainage basin of the Tennessee River.

The dotted line on the map marks the extent of this basin. It includes many watersheds and encompasses slightly more than 40,000 square miles or an area as big as England, Scotland, and Wales. In shape it resembles a giant pair of wings. On the edge of its eastern wing, it takes in mountains 6500 feet high and then drops to 300 feet above sea level at its western tip where the river enters the Ohio. When dealing with as universal and simple an element as water, the man-made boundaries must be discarded. For example, Nashville the capital of the state, though centrally located, belongs within a different land-water division. It is surrounded by the

Cumberland Plateau and comes within the drainage basin of the Cumberland River.

The regulation of the flow of water within the Tennessee Valley is the concern of the Tennessee Valley Authority, an agency established for this purpose by the United States government. This agency has been empowered to deal with the drainage basin of the Tennessee as a whole, working in cooperation with the seven states. Today, those living within this region, following the lead of the TVA, have learned to think of the Tennessee River and its tributaries as a single geographical area. They refer to it simply as "the Valley."

The Valley People

A large majority of the five million people now living within the Valley are descended from families that originally settled there four to five generations ago. In terms of racial origin most of these settlers were Scottish-Irish-English, with a common heritage and a common background. They came as pioneers to make a living from the soil, and to this day the Valley has remained essentially a rural and agricultural region. The great migrations of European industrial workers that swept across the country after the Civil War bypassed the Valley, moving on to the bustling centers of the Middle West. Perhaps as a result of being left to themselves, the people within the Valley show marked regional differences, and the old-time customs and habits, being undisturbed, have been handed down in a purer form than elsewhere in the country. Just as the countryside exhibits the extremes of north and south, so also do the people. The farmers and mountaineers of eastern Tennessee have generally been Republicans, with the same attitude toward slavery as their New England cousins, while the cotton planter from Muscle Shoals is as traditionally southern in point of view as his kinfolk, say, in Georgia.

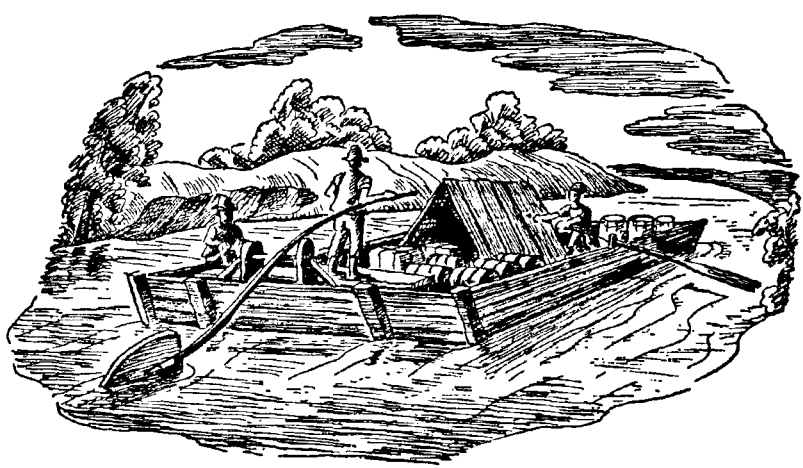
These regional differences, so easily recognized, tend to give a special character to each section of the Valley. But just as the flowing water of the main river and tributaries unites the mountain highlands with the flat cotton country of the lower Tennessee, binding all of it into one water system, so the common experience shared by the people living within that region, during the last century and a half, makes it possible to treat the history of the Valley as a single whole.

From the very first the Valley seemed to attract the more resourceful and independent citizens. It was their forebears who started that century-long pilgrimage into the wilderness. From the coastal plains of Virginia and the Carolinas they followed Daniel Boone through the gaps and defiles of the Appalachians into the rich valleys of Tennessee and Kentucky. They appropriated the ancient hunting preserves of the Cherokee nation. They floated down the Holston and the French Broad to the Tennessee River, which first carried them south to the dangerous rapids of Muscle Shoals and then north to the great inland waterway systems of the mid-continent. The virgin forests, the clear swift streams, the native pasture that fed the herds of deer and buffalo—these were their heritage; these were the natural resources of the Valley.

As history, it is a brief story of barely more than a hundred and fifty years, and only the last twenty of those years set it apart from the usual sequence of events that has occurred over and over again in almost every part of this country. That usual sequence is simply the record of the changes wrought by men with sharp axes and deep plows. From this point of view, the history of the Valley divides itself naturally into three parts. Perhaps the first part could best be described as "Floatin' Along," which begins with the one-way, downstream traffic of pioneers and settlers on the main river. It would also include the early commercial shipping and the agricultural development of the Valley up until the Civil War. This is the period

when the promises of nature were abundantly fulfilled. Next, under the heading "Trial and Error," would come the long middle years from 1865 on, during which the Valley became trapped in the descending spiral of wasted resources, both human and natural, until in 1933 it was the nation's "economic problem number one." The real concern of this book has to do with the story of the last twenty years, following the establishment of the Tennessee Valley Authority and how it has carried out its two vast programs of "Construction on the River" and "Reconstruction on the Land."

It is generally accepted that De Soto was the first white man to cross the Valley, and there is every reason to believe that the forest wilderness through which he traveled in 1540 was the same as that seen by Colonel John Donelson as he floated down the Tennessee River in the winter of 1779-1780. Colonel Donelson kept a journal of this expedition, and fortunately some of it has been preserved. The events that follow are woven around the record of the voyage "of the good boat *Adventure,* from Fort Patrick Henry on the Holston River to French Salt Springs on the Cumberland, as kept by John Donelson."



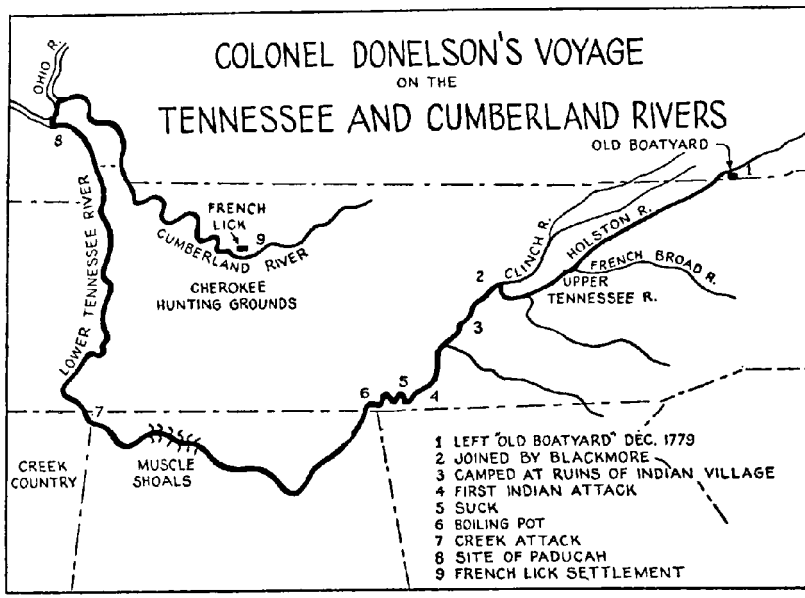
II: Floatin' Along

"Fast flows the river and down comes the rain."

Pioneers on an Inland River

THE expedition, under the command of Colonel John Donelson, pushed off from the "Old Boatyard" situated on the upper Holston River, a short distance below Fort Patrick Henry, Virginia, on a bitter cold morning late in December 1779. Colonel Donelson and his two partners, James Robertson, a surveyor, and Richard Henderson, a land speculator, had decided to establish an English settlement at French Lick on the Cumberland River, more than two hundred miles farther west in the wilderness. Robertson had left in October, with a party of hunters and Indian fighters to drive the horses and cattle through the mountains and across the plateau to the chosen site on the Cumberland River. There a fort and cabins were to be built in preparation for the other settlers, who, under Donelson's command, would take the long river journey down the Holston to the Tennessee, and on down the Tennessee to the Ohio, then up the Ohio to the Cumberland, and up that to French Lick. Though it meant going three-quarters of a circle, there was no other way to move the women and children, pigs and chickens, and all the other household necessities that would make the new settlement a real community and not just another fort isolated in the endless forest.

Donelson had some knowledge of the many dangers that lay ahead. He knew that somewhere downstream the Chickamaugas, an outlaw tribe of the Cherokees, led by their chief, Dragging Canoe, lay in wait for any stray white man that might attempt to pass up or down the river. The colonel had also been warned of the grave hazards of the river itself: first,



there were the Narrows, with the "Suck" and "Boiling Pot," where light craft might be crushed between the churning driftwood and the rocks; and later, the great rapids of Muscle Shoals, already famous as one of the most treacherous stretches of the river. With this in mind Donelson wanted to be well down on the main Tennessee before the rains started, for he knew that his only assurance of slipping past the Indians and avoiding the hazards of the river was to ride the crest of an early spring flood, when the current was swift and strong.

More than a hundred families were in the thirty boats that floated down the Holston in the bitter cold that morning. There were the Stuarts, on a large raft with only a lean-to tent to protect them. They had come over from the Watauga settlement, where they said the smallpox had broken out. Peter Looney, his wife, and four towheaded children were on a small flatboat, along with two hogs penned in a corner and half a dozen chickens. Young Mrs. Ephraim Peyton, whose husband had gone ahead overland with Robertson, started off

on board the Cartwrights' boat. Harrison and his tall son Reuben, two rawboned hunters, shared a long wooden canoe, known as a pirogue, which had been hewn from the butt of a giant tulip tree. The list of names of those that started on this migration indicated that almost all were of English stock —Ben Porter, Dan Chambers, John Montgomery, George White, Tom Boyd—families that had settled in the Piedmont and then, lured west by the promise of larger farms and richer lands, had joined together to make the long inland voyage, taking their chances along with the rest, putting their trust, in this case, in high water and a fast current.

As the expedition left the "Old Boatyard" that morning the mists that rose from patches of snow along the banks of the river almost hid the pale winter sun. The cold damp air was very still, and every sound carried a great distance across the water. The shouts and cries of the men poling the large flatboat out into midstream rang loud and harsh. As the current slowly caught and turned the awkward homemade craft, the man standing at the stern sweep raised a battered horn and blew three long mournful blasts that echoed far up and down the river valley. The little crowd of men and women grouped on

the bank shouted and cheered, while others standing in the doorways of the log cabins, set back from the river landing, waved their scarves and bonnets. One by one the smaller flatboats, barges, rafts, and even heavy log canoes were worked away from the bank until each in turn was picked up and carried on by the current. The people at the cabin doors could count thirty boats falling into line that morning, stringing out for more than a mile behind the largest flatboat, owned by Colonel Donelson and christened the *Adventure.*

It was the coldest winter that had ever been known in those parts, and ice formed on the still backwaters. There was no January thaw that year, and the water dropped almost to the level that it was in the fall. Everything seemed to delay them. It took three days to get Tom Boyd's and Jim Rounsifer's flatboats off a mud bank at Poor Valley Shoals. Only by wading in the icy water and unloading everything onto the bank could they float the boats over the shallows.

This homemade flotilla was more than a month making its way down the shallow Holston, and only after it had reached the main Tennessee River, a little above the present site of Knoxville, did the weather moderate and the winter rains begin. They now floated down a wide valley, and when the rainclouds lifted they could see the distant mountains on both sides. Oaks, chestnuts, and tulip trees formed the virgin forest that came down to the riverbank, ending with box elder and water maple, or black willow and river birch at the waterline. There were hidden snags and islands of driftwood, which made little whirlpools as the current passed. Jake Henry's clumsy raft was caught in one of these and upset. After the pitifully few belongings had been gathered up, a landing was made and a fire lit to dry out the rescued articles. Meanwhile Harrison and his son went off into the woods to shoot wild turkey. Within an hour they had killed a dozen turkeys and a young buck deer.

Three days later they passed the mouth of the little Tennessee, swollen to twice its size by the floods pouring down the valleys of the Great Smoky Mountains. A few miles farther on they sighted five boats tied up near the bank. These were the first human beings they had seen since leaving the "Old Boatyard," and Donelson was glad to welcome John Blackmore and his party of traders and Indian fighters aboard the *Adventure*. That night all the men were called to a kind of council meeting in the barnlike cabin of Donelson's boat. Blackmore, who had arranged to join the expedition, explained that they were now in Indian country: sentinels should be posted at night and the fleet should stay as close together as possible during the day. Mrs. Stuart had come down with smallpox, and it was agreed that the Stuarts' raft would have to take up the rear and that they must camp separately.

March came in cold and bleak with no sign of spring. As they passed the site of the abandoned Indian village, which had been burned down the year before by Major Shelby's soldiers, the sun broke through the clouds, bright and warm, after almost two weeks of steady rain. Here the women of the party insisted that they stop and make camp for a day or two, so that they could do some washing and dry their rain-soaked clothing. The men went hunting and fishing, and the children scampered in and out of the charred ruins, re-enacting the whole scene of carnage with blood-curdling yells. There was another very good reason for the two-day layover: Mrs. Peyton, whose husband had gone overland with Robertson, gave birth to a seven-pound boy the first night in camp.

By now the river was almost at flood stage, and, after breaking camp and poling the boats out into midstream, the fleet moved along swiftly. The hazards of sandbars and shoals had been replaced by those of floating logs and hidden snags. The Tennessee again broadened out, and to the southwest they could see the rugged highlands of the Cumberlands, while

directly ahead of them rose Lookout Mountain with its bare rock escarpment crowning the summit.

Without the slightest warning, they suddenly came on their first Indian village, situated on the south bank. The villagers were not taken by surprise, for they lined the shore and in a friendly fashion beckoned the boats to land on their side. Donelson ordered the men at the sweeps to keep the *Adventure* close to the opposite bank, and one by one the other boats followed.

Young John Donelson persuaded his father to let him and a man named Caffery go over to the village in a canoe for a parley. As they were leaving, a canoe put out from the south shore. The two met in the middle of the river and both turned back to the *Adventure*. In the first canoe there was a half-breed, Archy Coody, who, as the canoe drew alongside, dropped his paddle and sprang onto the deck of the flatboat, introducing himself very pleasantly to those on board.

The six Indians appeared very friendly, and soon they also were on the deck, talking and smiling. As Colonel Donelson went into the cabin to find some presents for the newcomers, John Blackmore, who was in the bow of the boat, gave a warning cry. A dozen or more canoes shot out from the opposite shore. These Indians were painted red and black, and as they paddled frantically across the water the sun glinted from the barrels of the guns balanced in their laps. Coody and the six unarmed Indians leaped back into their canoe, while Blackmore helped the men at the sweeps maneuver the *Adventure* back into the current. Colonel Donelson blew three long blasts on the horn, signaling the rest to follow. Once they were adrift, the flood tide carried them out of reach of their pursuers.

Later that same afternoon, as they swung into Moccasin Bend under the shadow of Lookout Mountain, the current swept them close to the north bank. A volley of shots rang out from the dense underbrush. A member of Dan Chamber's crew,

named Payne, fell dead on the raft. This was the first casualty. The second followed almost at once. As they rounded a sharp loop in the river, there on the south bank was another Indian village, but this time the war canoes were already putting out from the bank. The little fleet bravely ran the gantlet, answering shot for shot as it passed. The Stuarts, at the end of the procession, were cut off and surrounded. Long after the rest of the boats had ceased to fire they could hear, from upstream, the reports of the muskets and the screams of the women as the war canoes closed in on the unfortunate family. There was some small comfort in the knowledge that smallpox was a deadly scourge among the Indians.

The Tennessee River, after passing Lookout Mountain, turns back on itself and flows northwest into the gorge that it cut in prehistoric times through the jagged foothills of the Cumberlands. Donelson knew that ahead in those twisting valleys were the Narrows, with the dread "Suck" and "Boiling Pot." Under the dark Carolina hemlocks, giant rhododendrons and mountain laurel covered the steep rocky cliffs that formed the shoreline. Rainclouds hung between the hooked shoulders of the mountains, and in this somber light the deep and narrow river glided black and menacing around the bends. The party paused for a moment in preparation. The men took their stand in the bows of the boats, armed with long poles to ward off the hidden rocks and great floating trees that lunged about in whirlpools and eddies. John Cotten transferred his family to the Cartwrights' boat, tying his canoe with all his possessions to the stern. The flatboats and the rafts were twirled and spun this way and that as the cross-currents in the "Suck" dragged them from side to side. Most of the lighter craft fared better, bobbing on the surface like chips.

No sooner had they cleared the "Suck" than suddenly from the leading boats came the warning shout, "Indians," which was passed along to those that followed. Bands of savages in

their red and black warpaint could be seen running along the banks, carrying guns and making no attempt to hide. However, their warpath did not follow every curve of the river, and at times it looked as though they had given up the chase or dropped behind. Again the mountains closed in, and the surface of the river became very rough, flecked with foam and churning driftwood. This was the "Boiling Pot," and now the canoes and the pirogues had a hard time, until finally John Cotten's filled with water and capsized. Someone blew the horn on the *Adventure* as she pulled into the bank, followed by the nearest boats.

Just as the men jumped ashore and were starting back to help Cotten, a fusillade of shots came from the bluff above and sent them running back to their boats. The Indians rushed to the edge of the bluff and continued to fire on those below. The man steering Abe Gower's flatboat was wounded and dropped the sweep. Young Nancy Gower took his place and held the sweep until the current caught them, and then, with her skirt torn by bullets and a severe wound in the thigh, she steered the craft safely out of range. In the meantime Cotten had saved his canoe, though most of his things were lost. It was only later that afternoon that they realized that Jonathan Jenning's boat was missing. With him were his wife and son, as well as Mrs. Peyton, her baby, and two Negro slaves. As always, there was nothing for it but to go on. To turn back meant that the whole expedition would be endangered.

Late that night Jennings, his wife, and Mrs. Peyton stumbled into camp, cold, hungry, their clothes ripped and torn. In the excitement of the Indian attack their boat had upset. The Jennings' boy and one of the Negro slaves had been captured by the savages; the other slave had been drowned; and in the terrible confusion Mrs. Peyton's baby had been swept away in the current. The survivors were redistributed on other boats. In the morning Donelson gave orders for the fleet to move on.

At some points the Tennessee was now almost a mile wide. They were coming into the Great Bend country, where the river changes its course to a westerly direction. Here the land flattened out, taking on a gentler aspect; to the pioneer eye, the giant size of the trees indicated a deep rich soil. As they passed the open savannahs, filled with canebrakes, they could see the game trails, cut by herds of wild hogs and buffalo, leading down to the shore. Swan, geese, and ducks rose from the water as they drifted past.

By the middle of March the expedition had reached the head of Muscle Shoals. Before them lay the great rapids, and from the roaring turbulence of the water the mists rose like pearly steam in the morning light. Here was an angry river at flood crest, wildly and furiously fighting its way down the broad ledges and round the rock barricades that barred its path. The cargoes were covered and made fast, and everyone was given his position in the different boats, so that they would be well balanced. Once again, putting their faith in Providence and the high water of the spring flood to carry them through, the crews cut the fleet loose from the shore.

Donelson's own description cannot be improved: "When we approached them [the Shoals], they had a dreadful appearance to those who had never seen them before. The water being high, made a terrible roaring which could be heard at some distance among the driftwood heaped frightfully upon the points of the islands, the current running in every possible direction. Here we did not know how soon we would be dashed to pieces, and all our troubles ended at once. Our boats frequently dragged on the bottom, and appeared constantly in danger of striking: they warped as much as in a rough sea. But, by the hand of Providence, we are now preserved from this danger also. I know not the length of this wonderful shoals: it had been represented to me to be twenty-five or thirty miles; if so we must have descended very rapidly, as indeed we did,

for we passed it in three hours. Came to, and encamped on the northern shore, not far below the shoals, for the night."

A little beyond the Shoals, the Tennessee turns for the last time and flows due north for two hundred and fifty miles before emptying into the Ohio. For a week they floated through what appeared to be a desolate swamp, as the floodwaters covered the forest floor for miles on each side. Here they saw their first cypress trees, while on higher ground the sycamore and cottonwood replaced the oak and chestnut. Strangely enough, though they were now going north, spring had already come to this part of the valley, and the wild plums and cherries were in full bloom. On the twentieth of March, the expedition made camp on a point of land where the river town of Paducah would later be built. They rested there for a few days and took stock of their situation before attempting to move up the Ohio.

Their journey on the Tennessee had taken its toll. The food supplies were almost gone, and the crews were worn out with fatigue and hunger. The prospect of poling up the Ohio and then the Cumberland, with no exact knowledge of how far they had to go, seemed bad indeed. As Donelson wrote: "The scene is rendered still more melancholy, as several boats will not attempt to ascend the rapid current. Some intend to descend the Mississippi to Natchez, others are bound for Illinois." After all they had been through, it was sad watching those who had decided to go downstream push off from the shore and drift out onto the broad, muddy flood of the Ohio, which swept them on toward what were then the most remote frontiers of the continent.

Now came the exhausting work of poling slowly against the current, and from here on every yard upstream was a struggle. Their meat supply was easily replenished, for herds of buffalo ranged on both sides of the river; like the geese and swans, they were more curious than terrified of the hunters.

One sunny afternoon, while taking a rest on an open bluff

above the shore, they heard a strange sound that seemed to come from some distance off in the sky. Old Harrison, gaunt and sunburned, rose to listen. He had never heard wild geese like that before. The sound increased like a great rush of wind in the treetops. In a matter of seconds it grew dark and the sun disappeared as millions of wings beat the air above their heads. It took fully half an hour for that great cloud of passenger pigeons to pass the bluff, streaming northward toward their nesting place in a nearby beech forest. Harrison and some of the other men followed. On entering the beech grove they saw a strange sight, for it looked as though there had been a sudden fall of snow. The trees had been stripped of every leaf, and the floor of the forest was completely white, covered to a depth of six inches with pigeon droppings. Great branches broke under the weight of birds and crashed down, adding to the general confusion and roar, as the pigeons settled themselves above their heads. With a few long poles they knocked down all the birds they could carry back to the bluff.

Almost four months to the day since leaving the "Old Boatyard" on the Holston, the bows of their boats came to rest on the little sandy beach below the clearing in which a huddled group of cabins marked the settlement of French Lick. In that time they had traveled a thousand miles on inland waterways, leading down virgin valleys where nature's forces, held in balance, seemed to produce effortlessly a great abundance and variety of living things. They were not the first to go down the Tennessee, and there were thousands that would float behind them, anxiously watching the whirlpools in the "Suck," marking the currents in the "Boiling Pot," or frantically trying to right their boats as they shot over Muscle Shoals. They accepted the fact that out of the two hundred or more that started, thirty-three had been lost. At least a dozen would carry the scars of Indian bullets the rest of their lives. But the voyage was finished and the losses were forgotten in the

greater task of establishing a civilized community in the wilderness. This they did, and on the bluff above the river they built the town of Nashville, which later became the capital of the state of Tennessee.

Down to New Orleans

By the end of the eighteenth century the Chickamaugas and other outlaw tribes had been driven from the Tennessee River. Dragging Canoe was dead, and Governor Blount had made a firm peace treaty with the Cherokee nation. Settlements were springing up all along the river, and as the forest clearings

began to yield their new harvests farmers and plantation owners in the Valley had to find a way to market. The long overland route to the old markets of Baltimore and Philadelphia was no longer practical. As the quantity of farm produce increased, there was nothing for it but to float the corn and whisky, cotton and wheat, downstream.

This meant one-way traffic in flatboats all the way to New Orleans. These flatboats, or "broadhorns," were built more or less along the lines of the good ship *Adventure.* With the coming of the winter rains, the prosperous landowners loaded their year's harvest on board and pushed out into the current. Even the hardiest boatmen rarely attempted to descend Muscle Shoals except on the crest of an early spring flood. Once on the Mississippi, they were usually in the company of other boats and passed their days swapping tall tales and their evenings singing and dancing on the deck, while someone played "Old Zip Coon" on the fiddle. There never was any difficulty in disposing of their goods in New Orleans, and then, after a few days of high living, came the long walk home. Those returning to Tennessee and Kentucky struck out through the wilderness on the old Natchez Trail. On this lonely trail through the forest there was every chance that the weary traveler would be robbed of his year's profits, as well as his pants and shirt.

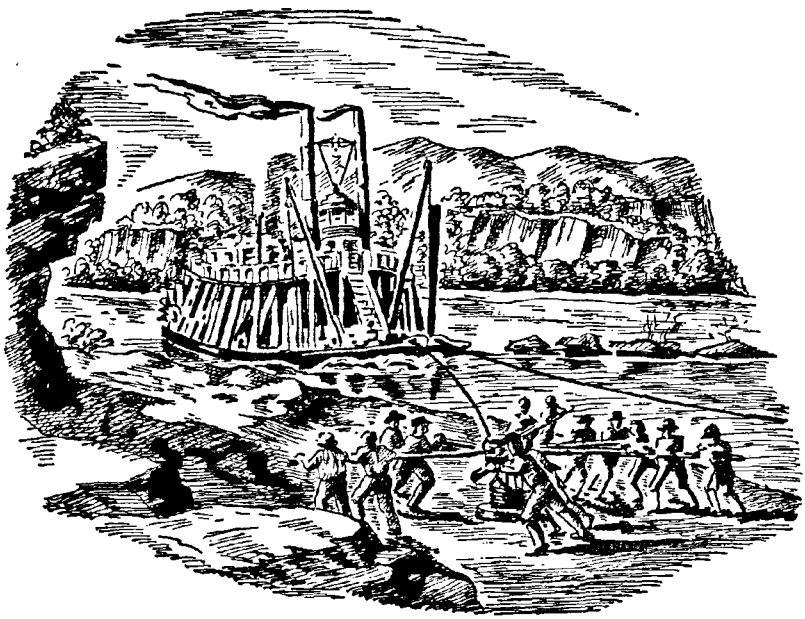
With the introduction of keelboats on the river, two-way traffic was possible, though slow and laborious. These new river craft had a catwalk or runway, set above the gunwale on each side, along which the crew plodded back and forth as they slowly poled the ship along. At first the keelboats only worked up and down the lower Tennessee, but soon they began plying back and forth, above the shoals, between Decatur and Knoxville. It could hardly be called a regular service, for these early keels, like the *Swan,* the *Bonnie Bark,* or the *Lucy Futter,* were still at the mercy of every whim of a temperamental river.

Besides the "Suck" and the "Boiling Pot" in the Narrows, the list of dangerous sections now included the "Sleek" and the "Skillet" as well as "Colbert's Shoals" and "Bee Tree Shoals."

It took more than three generations for the highland folk to penetrate into the mountains of eastern Tennessee, where they built their twin cabins with the roofed "breezeway" in between and cleared the little sloping fields in the coves and valleys. Compared with this slow migration, the opening of the Great Bend country to the south was a regular land boom. The rich planters from Georgia and the Carolinas came on horseback, their families riding ahead in well-appointed coaches, their Negro slaves driving great caravans of wagons and cattle. All of northern Alabama filled up in ten years, and as the price of cotton rose other plantations were established on the lower Tennessee from Florence down to Pittsburg Landing. The land that Donelson, Cartwright, and Blackmore had appraised with a knowing eye thirty years before, now fulfilled every expectation.

These were no modest homesteaders, content with small holdings. They soon found that the rich bottom lands would yield almost two bales of cotton to the acre, and they had the slave labor, not only to clear the land, but to build themselves fine white mansions, set in parks of magnolia and water oak. When the S.S. *Osage* came steaming up the lower Tennessee in 1821 and tied up at the wharf at Florence, below the Shoals, everyone was assured that the way was now open to the great world market of New Orleans.

Although cotton was king, the plantation owners in the Great Bend country found themselves trapped behind Muscle Shoals. Even during flood periods it was found far safer to carry the precious bales overland by wagon, around the Shoals, to the wharfs at Florence, where the steamboats picked them up for the long trip to the Gulf. It is little wonder then that they built one of the earliest railroads (1834) in the country: the

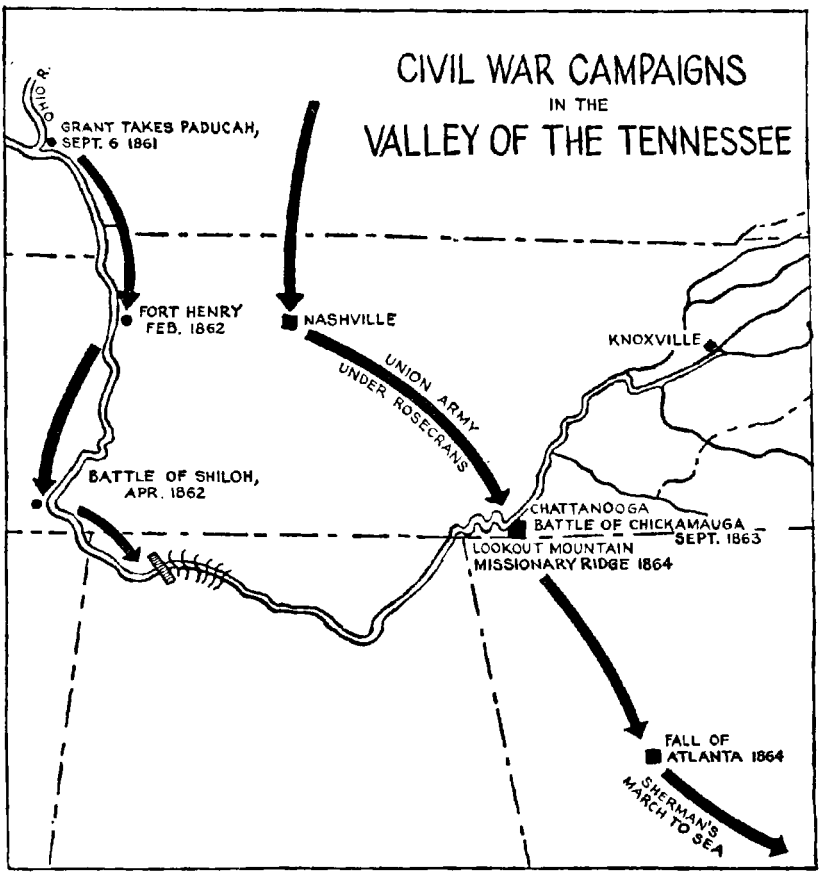


Tuscumbia, Courtland and Decatur Railroad, whose forty-two miles of primitive track bypassed the thirty-five-mile bottleneck. Only the lower Tennessee enjoyed the great days of the Mississippi steamboat when it was the most luxurious form of transportation in the United States. There were steam calliopes and string bands on these dashing river craft; fourteen-course dinners were served on board, with beefsteak for breakfast if you wished. Then there were the midnight races on the river, when the furnaces, "crammed resin and pine," sent black smoke and sparks belching from the funnels, while the Negro roustabouts sang on the forward deck. The other side of this romantic picture included the uncertainty of schedules, the long seasons when the water was so low that nothing could get up or down the river, as well as the frightful disasters caused by fire and exploding boilers.

The thirty years preceding the War between the States were years of great prosperity and vigorous expansion for the

people of the Valley. There were unlimited opportunities for those who, like the cotton planters, sought immediate financial returns from their crops and enterprises. Others who preferred the freedom and independence of the pioneer lived self-sufficient lives, holding to their traditions, developing their handicrafts and folk customs, and though proudly withdrawn in their mountain wilderness they nevertheless remained active and responsible citizens of the larger community. The promise of the next year's harvest was usually fulfilled, and in those days the young fishermen returned with long strings of rainbow trout or big mouth bass, and there were few hunters who had not killed a dozen deer by the age of sixteen.

As for the Tennessee River, it continued to flow in its unpredictable way, sulking along in summer, a muddy shallow stream, later in the year rampaging down the valley with houses and hencoops, trees and timber, crowning its flood crest, all to be contemptuously deposited in the makeshift canal built around one section of Muscle Shoals. However, the railroads that had been built beside the river or crisscrossed it on bridges linked the larger towns together, allowing for a more regular exchange of goods and people. From the building of that first little "one-horse" railroad that bypassed the Shoals, to the landing of Union troops under General Grant at Paducah, there were thirty years of peace and plenty for the Tennessee Valley.



III: Trial and Error

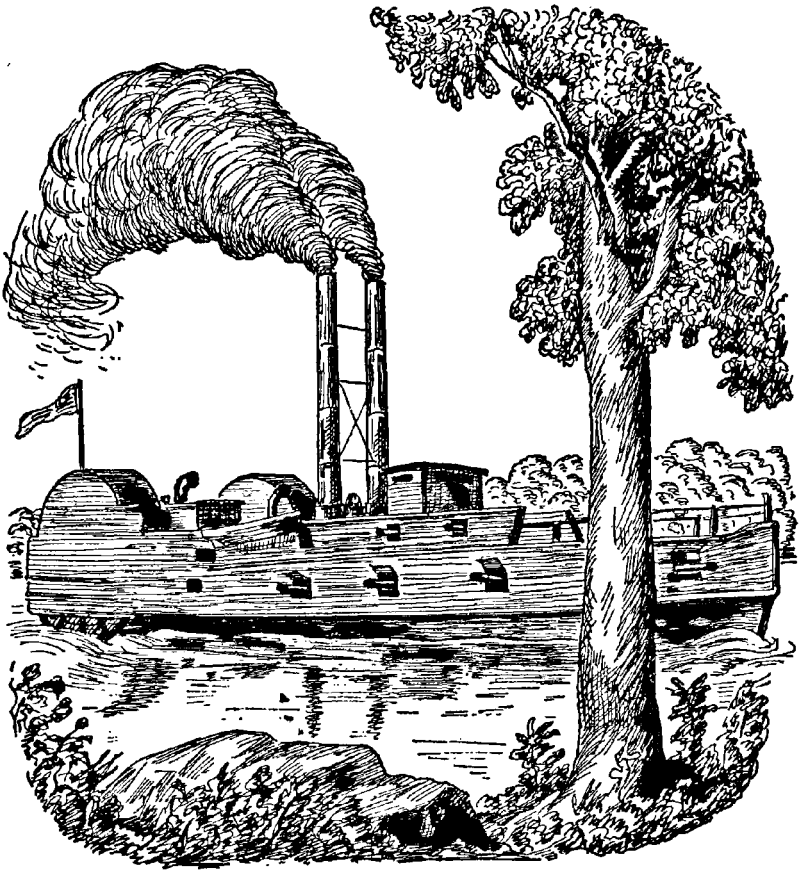
Gunboats on the River

AT THE start of the War between the States there were many generals and statesmen on the Northern side who believed that a few punitive raids below the Mason and Dixon Line would end the whole foolishness of secession. With this in mind, one part of the western campaign started at Paducah as an amphibious expedition up the Tennessee River. What

could be simpler than to turn the river craft of the Ohio into armored gunboats and, using the Tennessee as a military highway, steam into the very heart of the Confederacy and so end the war in a few months?

As you can see on the map, the progress of this expeditionary force was rather slow at first, but as more and more steamboats were converted into armored transports the campaign picked up speed. After the capture of Fort Henry this iron fleet moved a hundred and thirty miles up the inland river in two months' time, and perhaps Grant may have figured that at this rate he might even reach Atlanta by early summer. Two unforeseen factors, one human, the other natural, ruined any such calculation and changed the whole strategic plan. Though the Union Army was not completely routed at the Battle of Shiloh, it became clear that the Southerners were in deadly earnest and that from here on there would be nothing but stubborn, grim civil war. The natural factor, of course, was Muscle Shoals. The federal gunboats and transports were stopped at Florence and could not reach Chattanooga. For the next year and a half Muscle Shoals guarded the western flank of the Confederate Army from attack. This changed the course of the war.

The Great Bend and the upper Tennessee remained in Southern hands until a Union Army, under General Rosecrans, following the fall of Nashville, crossed the Cumberland Plateau and marched into Chattanooga from the northwest. Shortly after that, in the dust and blood of the Battle of Chickamauga, the South again stopped the Union Army, drove it back to Chattanooga, and for months held it in a state of siege. Finally, by means of temporary wooden bridges and the reconversion of an abandoned steamboat, the Northern supply lines were re-established on the upper Tennessee. As reinforcements arrived, the Union Army started south again, capturing Lookout Mountain and Missionary Ridge, which opened the



way for Sherman's march to Atlanta, and from there to the sea.

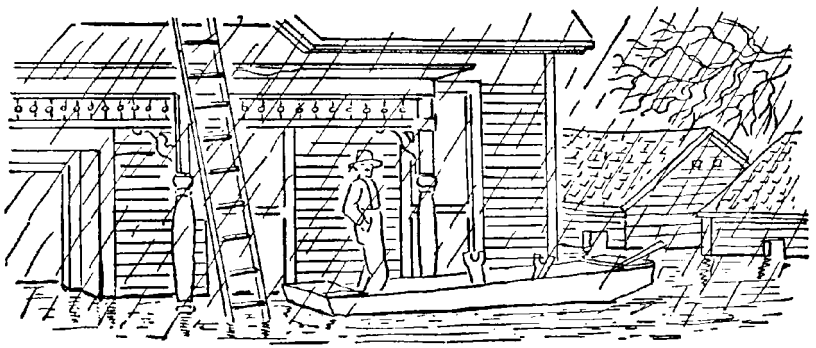
During all these land campaigns the gunboats continued to move up and down the lower Tennessee, keeping the supply lines open. General Bedford Forrest, famous for always getting there "fustest with the mostest," spent the last two years of the war slashing at this supply line, disrupting the armored fleet, and brilliantly outmaneuvering the Yankee officers sent out to catch him. The Northern commanders classified these attacks as "guerrilla warfare" and retaliated by wreaking havoc on the river towns and plantations. The effects of total war on

the Tennessee River Valley were just as destructive as anything that occurred in northern Virginia or on the trail of ashes left by Sherman. The raids and counterraids left the valley a burned-out wasteland.

When Confederate veterans began straggling back to their native villages and towns along the river, in many cases they literally could not find them. One returning officer reported that, after walking ten miles through what had been a rich and populous farming district, he had counted only three houses still standing. The towns of Clifton and Tuscumbia on the lower Tennessee had been completely burned down, and eyewitnesses related that, in the moonlight, the gaunt rows of brick chimneys looked like tombstones. In the Great Bend the cotton towns of Guntersville and Decatur had been shelled and burned, their warehouses wrecked, and the docks destroyed. The railroads that connected the inland towns were ripped up, and every bridge from Knoxville to the Ohio had been torn down.

One unforeseen result of the four years of struggle was noted by Donald Davidson in his excellent history of the Tennessee River: "The wilderness, the fruitful soil, and the unbroken spirit of the people remained. Soil and people had lost much; the wilderness had gained. And so a strange thing happened. Brazelton, the historian of Hardin County, tells how, in those days, the wild game of the forest and river greatly multiplied, for in the four years when men were hunting each other, the wild game had not been hunted. In some parts of the Tennessee Valley the wild game supported the population until new crops could be raised, and cattle, hogs, and poultry bred. Not since pioneer days had the folks of Hardin County, and many other counties, had such a feast of wild turkey, quail, deer, and the fish of the river." [1]

[1] Donald Davidson, *Tennessee* (New York: Rinehart & Co.; Vol. I, 1946, Vol. II, 1948).



Flood of 1867

People living in the mountains of eastern Tennessee had become accustomed to the driving rainstorms that swept over that part of the Valley during February and March. They counted on having high water, or a "tide," as they called it, at that time of year, and they usually got it. In 1867 there had been a normal fall of snow and rain up until Washington's Birthday, but then the heavens really opened, and every stream and rivulet in the mountains went wild. No one kept exact or official records of the rainfall in those days, but the estimate seems to be that more than fourteen inches fell in less than two weeks. One storm following another rushed northeast from the Gulf of Mexico and piled up on the high ridges of the Appalachians, spilling their contents on the already saturated earth. One of the unusual features on this particular occasion, judging from the local reports, was the great extent of these storms, which inundated not a part, but the whole, of the drainage basin of the upper Tennessee:

Knoxville, March 6-8

We are now in the midst of a terrible flood. The waters are upon us and continue to come. The valuable bridge across the Holston has been swept away and not even a vestige can now

be seen to indicate that such a structure ever stood. On the night of the second, the storms came—and such storms; all will remember that the rains fell in torrents, the lightnings flashed and the thunder clashed, and from Saturday night to Thursday morning the rains continued and the floods followed. The water stands at this time ten feet seven inches higher than known to the oldest inhabitant.

Wautauga, March 9

Homes, machinery, flatboats, laden with various products of the country, minus helmsmen or oarsmen, household and kitchen furniture, beds and clothing, etc., all these sailed along on the crest of the tide with great rapidity. A family, clinging to the wreck, crying aloud for assistance, but who, alas! were beyond the reach of human aid.

Chattanooga, March 10

The Tennessee River rose steadily at the average rate of four inches per hour, and to the driftwood and rafts floating upon its raging waters were added numerous log cabins and small dwelling houses that had been swept away from its banks. At the Crutchfield House, the water about noon flooded all the outbuildings. Too much water in the kitchen drove out the cook, and they were compelled to transfer their operations to another locality. The beautiful garden in the front of the house which had promised so much is now two feet under water and the fences floating. We have no heart this morning to dwell at length upon the terrible calamity which has befallen the citizens of Chattanooga and surrounding country. In Chattanooga, tonight, there is seven to eight feet of water on all the streets. The water was up to the base of the lime kiln on the cliff above the town. This shows that the water has risen fifty feet. It is stated that the back water extends up Lookout Mountain Valley to a distance of forty miles from the

river. A gentleman informs us that he has counted fifteen bodies of men, women and children, black and white, floating past his place on the road to Moccasin Bend.

The S.S. *Cherokee,* one of the few remaining steamboats on the upper Tennessee, under the command of Captain Wilson, steamed out across back country near Chattanooga. He piloted his boat down county roads and across cornfields. The captain hove to in barnyards to rescue the owners and their families from the eaves and rooftops. After loading on as many survivors as the boat could safely carry, he turned back toward the river and followed the crest down through the Narrows. Of course, anything is believable under circumstances like that, and so the claim of the crew that the river stood at seventy feet above the low water mark in the "Suck" and that they hurtled down the sixty miles in two hours, with the stern paddlewheel in reverse, has to be taken on faith.

The Middle Years

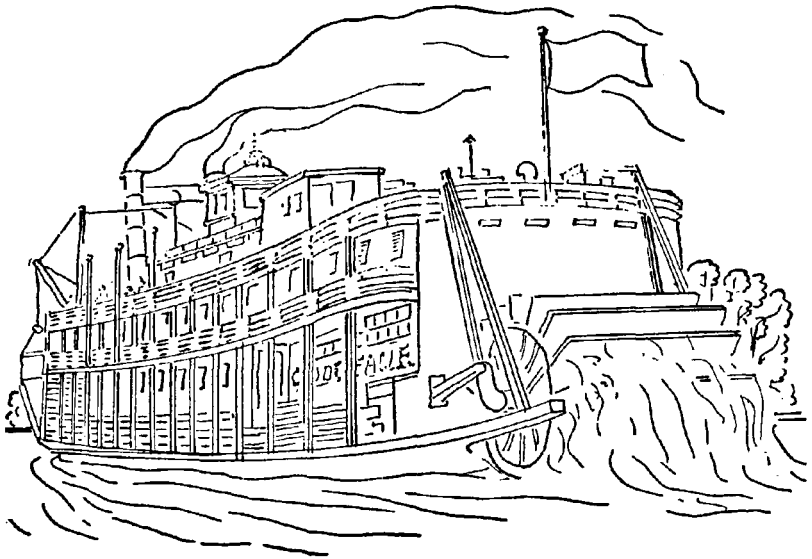
Though the flood of 1867 was the greatest ever known in the Valley and though it made a clean sweep from the Great Smokies to the Ohio, it could not wash away the suspicion and hatred left by the war. During the Reconstruction Period, these bitter feelings found their expression in various ways common to the South: the blossoming of the Klu Klux Klan, political chicanery, and carpetbagging, or, more often, it took the form of a withdrawal into the past, which for the mountain folk meant a continuation of their pioneer tradition at a bare subsistence level. As Davidson indicates, the spirit of the people had not been broken, for their continuing efforts to keep step with the general expansion that was going on in the rest of the country disproved any such sense of defeat. But it did seem that every effort they made, and every scheme they went

into, only proved further the grave disadvantages of their situation. In the light of what the sons and daughters of these same people have accomplished in the last twenty years, it becomes clear that this long period of trial and error, lasting from the Civil War to the depth of the depression in 1933, was not the result of any special defect of character or weakness of purpose. It was simply that during those seventy years they lacked the political strength and financial reserves to carry them over the ever-recurring economic crises of inflation and deflation, the endless repetition of boom or bust which marked that particular period of our history.

Later on in this book, when we reach the story of the Tennessee Valley Authority and its many-sided and interlocking programs, it will be necessary to divide it into separate categories, in order to explain how the various parts of the total plan were carried forward. These same divisions can be used in the study of the sixty-year period prior to the TVA; and so, for the sake of uniformity and simplicity, we will deal with each in turn.

NAVIGATION

Steamboat traffic on the lower Tennessee had always been an extension of the larger inland waterway system of the Mississippi, and naturally it reflected all the changes that occurred on the big river. After the Civil War the luxurious passenger packets of the great days of the old riverboats began to disappear; and as the service changed to the movement of bulk freight, the towboat, with its string of barges, slowly replaced the older floating gingerbread castles. During the '90s there was a revival of steamboat service on the upper Tennessee, between Decatur and Knoxville. It was more expensive to ship goods by rail, but the uncertainties of the steamboat schedules, caused by the erratic fluctuations of the river, worked to the advantage of the railroads, and by 1915



they had driven their rivals on the river out of business. Until the 1930s the upper Tennessee was still used by a variety of craft. The old one-way downstream traffic still continued as poor tenants and farmers floated their families and household goods along, looking for new lease holdings. Great log rafts from the mountain valleys still rode the spring "tide" down to the sawmills. Old decrepit steamboats were turned into floating general stores, known as "chicken boats," which puffed leisurely up and down, swapping a large assortment of merchandise for local farm produce. Although this was picturesque, it remained a very limited and entirely regional commerce. The wheat and steel, oil and coal, produced in other states had still to be brought in by the railroads.

It was evident to everyone, including the federal government, that the Tennessee River could become a vitally important inland waterway, connecting the agricultural South with the industrial Middle West. For a hundred years one scheme after another was proposed for accomplishing this, but, as you

will see later, most of them got stuck on Muscle Shoals. The cost of making a navigable channel from Knoxville to Paducah, which was taken as a single project, was out of the question. It had to wait.

FLOOD CONTROL

If there were some way to isolate and label a hundred gallons of water, and then follow its criminal career from the moment it poured off a barn roof, say, in upper Clay County, North Carolina, and note its course down the Hiwassee River, adding its turbulence to the general chaos, then one might get some idea of the repetitive destruction the very same mass of water can cause all down the Valley. After wrecking Mrs. Jones's kitchen in Chattanooga, the same entity of water two days later can leave Mrs. Brown's best hats, tucked on the top shelf of her closet in Decatur, a soggy mess. It would be bad enough if this wild career were confined only to the Tennessee River, but until that hundred gallons merges with the Gulf of Mexico it remains a lethal threat during the whole 2000-mile journey. A big flood on the Tennessee used to contribute 20 per cent to the flood water of the Mississippi. This meant another rise of three feet in the flood stage of the great river, which, in turn, spelled death and catastrophe for hundreds of communities.

As Chattanooga grew from a town of 5000 to a city of a 120,000 in these sixty years, the annual cost of flood damage grew proportionately. In 1917 the river went on a particularly bad spree, and, as it neared the 50-foot mark, a newly built industrial section of the city was inundated. The exasperated citizens demanded that the Chamber of Commerce do something about it, and after appealing to the state legislature it was found that the cost of flood protection would be so prohibitive that neither the city nor the state could undertake the engineers' plans. This also had to wait.

AGRICULTURE

One of the most remarkable features of the Tennessee Valley, just prior to the Civil War, was the great variety of crops grown and the diverse ways in which the people made a living from the soil. In northeastern Tennessee, during this period, the land-owners carried on a general type of farming; that is, they raised beef cattle, did some dairying, and grew crops of small grains and tobacco. By the end of the nineteenth century, in spite of this diversity of crops, western competition began to drive them out of the local markets. Kansas wheat undersold the native product in Knoxville and Chattanooga. As the economic pressure became greater, they turned to the raising of corn as a cash crop. The herds were sold off, the pasture slopes plowed up and planted to corn or tobacco every year.

The mountain farms, on the other hand, had always seemed to be run at a bare subsistence level. All during the 1850s and later, this appearance might prove deceptive, for the owner of the little two-room cabin, with his ten acres of run-out corn, often turned out to be a very substantial citizen. His hidden prosperity was based on the herds of beef cattle and hogs that he turned loose on the open range in the mountains. These herds roamed the forest and lived on the natural pasturage that had supported the buffalo and deer. In the fall there would be great roundups, and the mountain "cowboys," riding Chicasaw ponies, would drive thousands of head of stock from the hills and down to market. Here again, western competition won out, for by the '80s well-fattened western beef, shipped from the new stockyards in Chicago, flooded the markets, and the lean mountain herds slowly disappeared from the highland ranges. However, as you will see later, this did not mean that these mountaineers abandoned their little hillside farms. They also started to raise corn as a cash crop.

Soon after the Civil War the planters in the Great Bend were again growing large crops of cotton, but the profits were modest as compared with the old days. Though Negro labor was still cheap and plentiful, they found that they had to extend their acreage in order to make as many bales as before. King Cotton had taken his toll even on these rich bottom lands, and a bale to the acre was now considered a good yield. Year after year the wide hundred-acre fields turned white, while the colored hands deftly plucked off the white fluff, which was then ginned, baled, weighed, and shipped down the river to the great cotton warehouses at Memphis, Natchez, and New Orleans. The cotton merchants or factors in these trading centers could always find a ready market and were very glad to extend credit to the planters upriver. In time the yield per acre began to drop again, to such a point that it became necessary to use large quantities of commercial fertilizers. So the traditional cash crop of the South took more and more cash to produce, and though the planter could get credit against his next year's crop the margin of profit dropped again, and what little was left followed the cotton downriver in terms of interest rates to the cotton factor. But in spite of the tedious cycle of debt and bankruptcy, wherever cotton could be grown in the Valley it was still planted as the cash crop.

FORESTS

As the railroads penetrated the valleys of eastern Tennessee, the lumbermen followed and started to "clean cut" the hardwood forests. The building boom in the Northern cities put a premium on white oak and chestnut flooring, and it took little persuasion and little money to get the local owners to sign over their magnificent stands of timber. The destruction of the forests in the Valley area followed the customary routine procedures of other regions. The lumber interests in their march inland from the Atlantic had already passed on to Michigan

and Minnesota, and this was merely a mopping-up operation in a section that had remained isolated until it was opened up by the railroads.

No More Margin

The trials and errors of those sixty years became an accepted way of life. The bushels of corn and the pounds of cotton trapped the vitality of the soil within them, and the little cash in hand could in no way replace the basic resources that were continuously being shipped out of the region. Whether one was a highlander or a Valley farmer, it still meant trading the year's harvest at auction for manufactured articles at a fixed price. Six bushels of corn could buy a pair of shoes one year, but by the time they were worn out it might take eight. According to Gordon R. Clapp, chairman of the Board of the TVA, "The raw materials which were produced from the land and forests were exported to other regions to be made into finished products. This arrangement brought small return to the people of the Valley. The wealth that comes from human skills and machine production contributed to the income of other sections of the country, where the Valley's raw materials were processed. This forced many men and women to migrate from the Tennessee Valley to work in the factories of other regions; thus much of the human resource of the Valley followed the exported raw materials that their own kin had produced."

The head of the Department of Sociology of the University of Tennessee, William E. Cole, made the following summary at a United Nation's meeting: "The Valley is a part of that area which, in the 1930s, was dubbed 'the nation's number one economic problem,' and probably correctly so. There the soils were rapidly being depleted and the forest resources had been largely destroyed. The river was not being used for navigation;

it was subject to periods of disastrous floods; its potential hydroelectric power was undeveloped."

At first the people of the Valley took the depression of the early 1930s in a somewhat casual way. They had seen things go wrong before, and, by nature proudly independent and resourceful, they still had the self-reliance and belief that they could see it through. Years of subsistence farming had taught them how to extend their meager supply of this world's goods almost indefinitely. But when in 1933 the nation's industry finally ground to a standstill, and farmers found it simpler to burn their harvest rather than carry it to market, and banks closed, so did their hearts and minds, and the long tradition of fortitude seemed to have come to an end.

Two years later the TVA was already planning to build a large dam across the Tennessee River at Guntersville, Alabama, in the Great Bend district. The dam would back water 80 miles upstream and would necessitate relocating 1200 families. This had been a well-to-do farming district, and the following brief excerpts from the engineers' investigation of the economic and social conditions of these families were not chosen as examples to illustrate the depth of poverty that existed at that time. There were many sections of the Valley in which conditions were far worse. The farmers around Guntersville were well above average.

The engineers reported that the farms in the Guntersville area were somewhat larger than those farther down the river. The average crop acreage was 30 to 40 acres, half of which was planted in cotton.

The typical farmhouse was an unpainted building twenty-five years old, containing three to four rooms. For water supply, two-thirds depended on dug wells. Out of the 1200 families, 13 had bathtubs, 12 had inside toilets. About 60 per cent had no toilet facilities of any kind. Only 27 families had telephones, 34 had electricity.

Five out of every six family heads were engaged in farming. A little less than one-third owned and operated their own farms, making a net cash income of 367 dollars per year. (Multiply this by 2 for today's equivalent.) Next came the tenant farmers, who represented more than a third of the inhabitants and usually ended the year with an income of 239 dollars. The rest were sharecroppers and farm laborers, who rarely had more than 15 dollars a month for all expenses. Only 130 Negro families lived in this district.

The majority had had no formal schooling, beyond the rural elementary school. Nearly 10 per cent of the husbands had never attended school, and more than 300 children of school age followed their fathers' example.

One family in five owned an automobile, but half of these were over seven years old.

The effects of malnutrition were evident. Hookworm was common. Every third person had malaria.

IV: Clay County Chronicle I

(*1865-1932*)

ON THE theory that one specific example may be worth a dozen general observations, let us again change the camera focus and move into the Valley for a close-up of a typical highland farm in the mountains of North Carolina. More correctly, this is a case history of the seventy-five acres owned and operated by the Medford family for five generations. The Medford farm is in the southwestern tip of North Carolina, in Clay County. These seventy-five acres lie tucked in a cove on the eastern slope of the Tusquittee Mountains. A small brook, which starts from a clear spring set high above the farm in a hemlock-shadowed glen, runs down the middle of the cove. This brook joins the Peckerwood Branch in the narrow valley just below the farm, and the branch flows southward through open rolling country into the Hiwassee River. And so the Medford farm, lying within the Hiwassee watershed, thus becomes a part of the drainage basin of the Tennessee.

A farm is more than just so many acres of land, producing such and such crops that support a certain number of domestic animals. The bare record of what the Medford family did with those seventy-five acres over a period of a little more than one hundred years would be meaningless unless one understands the hopes and aspirations of those that lived there. This was the Medfords' home, and their fortunes and their way of life were completely bound up with those seventy-five acres. As the farm changed, so did the people who depended on it for a living.

1865-1882

After his father's death, at the close of the Civil War, Jim Medford, at the age of twenty-one, moved from Mount Airy, Georgia, to live with his uncle, Tom Medford, in Clay County. His uncle was a widower, living with his only daughter Emma, and as the mountain farm grew and prospered he needed a strong young man like Jim to help him run it. Thomas Medford had come into those mountains twenty years before with only an ax and a gun. Like the other newcomers, he was an expert with both. After Clay County was established, he received his deed for the seventy-five acres that stretched from the Peckerwood Branch up the mountainside. By the time Jim arrived, Tom Medford was considered one of the well-to-do citizens of the district. There was a great deal of speculation as to just how many head of cattle he had up on the mountain ranges. Two years before a cattleman had come through the county, and it was said that he had driven more than thirty head of Medford's steers to market in Asheville.

Tom Medford was an independent Republican. He had never owned slaves and did not want colored folks on the place. When he needed extra hands he hired some of the Hankinson boys who lived in the next cove down the valley. They had helped him build the big barn close beside the brook. From the barnyard a steep pathway led up the hill to the two log cabins with the usual "breezeway," or porch, between them. Dotted around the clearing were a smokehouse, an open shed for fattening pigs, and two small chickenhouses. On each side of the path between the barn and the cabins were rows of apple trees—Limber and Willow Twig on one side, Buff and Golden Pippins on the other. Below the barn were two fairly level fields bordering the Peckerwood Branch. Each year these lots were planted to corn, and the heavy loam, washed from the mountainside, still produced sixty bushels to the acre.

It did not take Jim long to catch on to the way his uncle liked to have things done. After all, he had helped his father during those five years between finishing at Miss Sarah's one-room school in Mount Airy and joining Colonel Lamar's local regiment. Uncle Tom was a kind man by nature. True, he had the highlander's customary reticence, and though at times he seemed stern and hard-bitten he was a good teacher. From his long experience as hunter, woodsman, and farmer Jim learned not only the easy skillful way to do things, but all the reasons why the mountain folk did them in that particular way. There was a special time and season for everything that was done on the farm. In the full cycle of the year every undertaking followed a fixed sequence that seemed to start at a special sign or signal given by nature and interpreted by his uncle. Corn should be in the ground by the time the first green shoots on the white oak were no bigger than a squirrel's paw. If the crop was going to be any good one ought to be able to tie the tassels over a mule's back before the fourth of July. New moon, full moon, waning moon—each stage had its influence on the year's vegetables and fruit. Slaughter a hog at the wrong time of the moon and the meat would go bad. Early spring was the time to clear the land and burn off last year's weeds and rubbish. Until the blackberries were in blossom there was always a chance of a killing frost. Fruits and berries must be dried before the line storms came in the fall. Hunting and fishing were best when the branches were bare and the streams clear.

There were also the special events of the community that had to fit this natural schedule of the seasons. The annual sessions of the circuit court at Hayesville were held in the early fall. Religious revivals and camp meetings had to wait until the middle of August, by which time most of the crops had been harvested. In the fall there were roundups of cattle on the open ranges in the mountains. Each farmer had his own mark or brand, and the yearlings had to be caught and their ears

notched. The mature steers were brought down to the corrals in the valley before starting on the dusty journey to market. Sprinkled at random throughout the year were weddings and dances, church suppers and turkey shoots.

Besides turning the cattle out on the open range, Uncle Tom saw to it that his herd of hogs got their fill of sweet mast—ripe white-oak acorns and chestnuts. The second fall that Jim was there they loaded a wagon with smoked hams and dried apples and, with two fine steers following on lead ropes, again made the long hundred-mile trip down to Augusta, Georgia. This time they sold everything, including the wagon and the mules. Jim bought a wedding ring, while his uncle made a sharp trade on a stout little gray mare and a shiny new buggy. With this new rig they got back to the Tusquittee Mountains in half the time. That spring Jim Medford married Martha Hankinson who lived in the next cove.

In time Uncle Tom turned the running of the farm over to his nephew. As the corn yield on the two lower fields began to drop, Uncle Tom warned Jim that the land needed a rest and that new ground must be cleared farther up the cove. And so Jim started the hard labor of cutting the timber and burning it on the hillsides above the cabins. In spite of having to plow in out of the stumps he was usually able to raise enough corn on these new clearings to look after all the stock on the place. As the years went by, this practice of abandoning the run-out fields and clearing new land higher up the mountainside became a regular part of the farm routine.

Jim and Martha were so busy trying to keep up with the ever-changing size of their family that they did not notice the general changes that were slowly taking place in the county. But the older farmers on the courthouse steps noticed them, and there was a good deal of head scratching as to what could be done. Was the natural pasture on the mountain ranges giving out? The cattle strayed farther and farther than they ever

had before; in fact, some of the farmers had lost their herds entirely over by Nantahala Creek. At the last roundup everyone had to admit "they was the poorest-lookin' critters you ever seed—nothin' but bones and hide." That fall Uncle Tom took a pocketful of his best Buff Pippins in to his old friends on the steps. He split the apples open with his pocketknife and in disgust pointed to the worm streaks in the white flesh. "Only fittin' for pigs now," he growled. "Won't keep till Christmas. Warn't enough sound ones to make a pie. If it hadn't been for the Willow Twigs we'd had no fruit all winter."

1882-1912

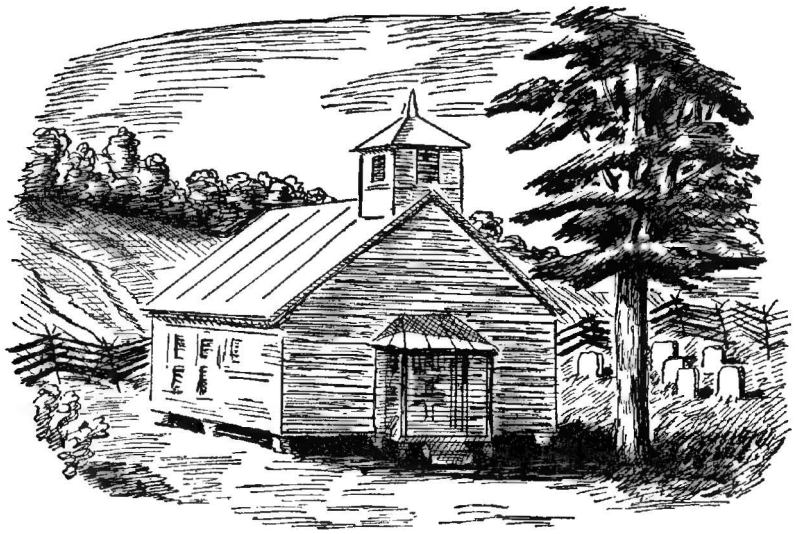
Thomas Medford died in 1882, just three years before the railroad reached Hayesville. He left the farm to Jim and the residue of his estate, which was in the bank in Murphy, to his daughter Emma, who had married years before and moved to Missouri. Jim Medford always promised himself that he would open an account in the Murphy bank like his uncle. As long as the family stayed on the mountainside, weeks and weeks would go by without Jim or Martha even thinking about the few bills and coins that were hidden somewhere around the cabin. Long before his uncle died the last of the herds of stock on the open range had been sold. However, the annual sale of the tobacco crop and a few hundred bushels of corn, along with two or three calfs and half a dozen pigs, just about balanced off the taxes and the few essential supplies that were purchased in Hayesville. But never was there enough cash to warrant the long trip to the bank in Murphy.

Even with four hungry, growing children there was always plenty to eat on the Medford farm. Besides the usual farm staples, the wilderness around them still provided an abundance and variety of foods for the family table. As compared with the old days, game was getting scarcer, but venison, bear, wild turkey, and squirrels still formed a basic part of the winter

meat supply. Every so often the whole district would turn out to hunt the wild pigs that still roamed the forest. There were fewer trout in the Peckerwood Branch, but a good fisherman could still come back from a day's fishing on the Hiwassee with a string of bream and jack. Half a dozen varieties of berries and wild plums were turned into pies and jellies. Honey from the wild laurel made a nice change from the usual sorghum or "black strap" molasses. Besides providing these delicacies, the wilderness was Martha's own medicine chest. From her mother and grandmother she had learned the traditional use of certain "herbs and simples" to relieve the family's pains and aches.

Jim's oldest son, John, was interested only in farming and hunting, but his younger brother Leland was a born scholar. His mother was firm in her belief that if Leland could go to the State University at Raleigh he would become a brilliant lawyer. Leland Medford might never have left Clay County if it had not been for the new lumber company that started operations two years after the railroad had been completed. While Leland was still at the academy in Hayesville a representative of the lumber company made Jim Medford an offer on the fifty acres of magnificent white oak and chestnut trees that stood on what Uncle Tom had always referred to as the western slope. It was Martha who persuaded Jim to accept the company's five hundred dollars, and though she had been confined to bed that spring on doctor's orders she took the train to Murphy and opened a savings account in Leland's name.

Late that summer Leland said good-by to his mother for the last time. The week before he left for the university the lumber company started cutting timber on the western slope. Martha could hear the ring of the axes and the shouts of the men as the big trees crashed to the ground. As she lay there listening, she wondered what the hillside would look like from the porch with all the trees cut. None of the family spoke of it,



and she did not ask. Long before the last of the giant oaks had fallen, Martha Medford was buried in the little graveyard in back of the Baptist church.

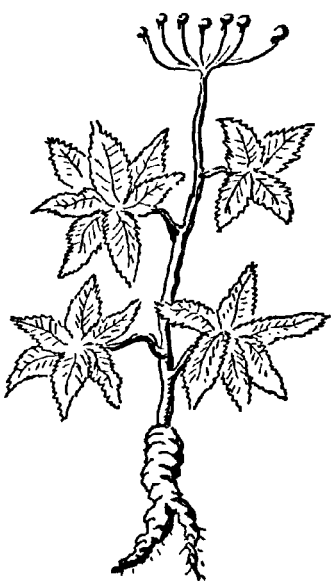
In the southern Appalachians the four seasons are clearly marked and each retains its special character, though the change from one to the next is not as severe or abrupt as in New England. The full cycle of the year is more evenly divided, and as fall slips gently into winter and winter into spring, the seasons pass with quiet regularity, unpunctuated by extremes of weather, and so one year becomes almost indistinguishable from the rest. As time went on, the old saying that life on the farm was either dull routine or disaster seemed to fit the Medfords all too well. Not that their misfortunes were any different or any greater than those of other mountain families, and the dull routine was only the reflection of nature's own timetable as originally interpreted by Uncle Tom and now rigidly adhered to three generations later. For Jim Medford was careful to explain to his oldest boy all the ways and customs that he himself had learned from his uncle.

During those years John and his father tried to increase the cash income from the farm by planting more and more tobacco. One year out of five they might make an extra hundred dollars, but usually if the crop was good the market went to pieces or vice versa. The price of corn might vary some from year to year, but it had the advantage that if you decided not to sell it you could always feed it to the stock, and by the time the hogs were ready to butcher it might turn out that you had done better than you had thought. Jim finally came to the conclusion that if he could just grow enough corn his money troubles would be over. He had always been able to pay his taxes on time and the farm was still free and clear, but he just never seemed to be able to get ahead enough to pay off what he owed in some of the stores in Hayesville. He could tell that "they didn't like it none and were afixin' to cut him off."

On one of his trips to Hayesville, John, who now did most of the farming, heard a farmer describe how he had planted some red clover on a piece of land, and after he had gotten a good catch and the clover was a foot high he had turned the cows in on it for the rest of the summer. In the fall he had plowed the sod under and the next year he had the best corn crop he had ever grown. John finally persuaded his father to let him try it, though Jim remained skeptical, maintaining that "grass only comes in where it will grow nat'r'lly, and there's nothin' one can do about it."

That spring there was a very late frost that killed most of the tobacco seedlings, and, as often happens, this was followed by a long drought. John's clover made a start but was finally burned out by the scorching June sun. By the fourth of July everyone could tell that there would be a very light corn crop that year. Many evenings that summer Jim Medford sat on the little porch in front of the cabins and, as he looked over his sloping fields, wondered if there would be enough to feed the animals over the winter.

Again it was the wilderness of mountains and forest that came to the rescue of the Medford family—this time in the form of a wild flower. One of the oldest and most popular medicines in China is brewed from the roots of the ginseng plant, once common there but now almost extinct. Scattered throughout the Alleghenies and the Appalachians were small patches of this herb, and the constant demand for it made it a stable article of barter in the mountain districts. It was John's



young wife who found the large patch of ginseng, in full yellow flower, while gathering berries far up on the mountainside near the spring. Three days later Jim stopped at the hardware store in Hayesville with a crocus sack filled with the roots. The storekeeper gave Jim a credit of forty-five dollars against his bill. That first patch was the largest the Medford family ever found, but for years they hunted it and gathered it, and the ginseng root took the place of that little hoard of paper and coins that Jim and Martha used to hide around the cabin.

But no matter which way Jim Medford turned he could not feed and clothe the three grownups and six grandchildren that filled the cabins. At the age of sixty Jim had to go to work for the local lumber company. In the past twenty years the Medfords had run their farm at a bare subsistence level. In terms of a going business it was submarginal; that is to say, if anyone had bothered to keep the records or accounts of the farm, these would always have indicated a substantial loss, well below the margin of profit.

Despite the hardships, curtailments, and even actual hunger, it never occurred to any of the Medfords that they might be better off if they abandoned their mountain farm. The hard facts of bookkeeping, even if they could have been explained to John Medford, never would have persuaded him to move his family to some industrial center where all of them might find work in a factory. On the contrary, they preferred to "manage somehow, even if it meant givin' up a lot of fancy frills and newfangled idees." Of course, what it actually meant was that, while John Medford continued to plow his little fields, tipped at all angles, the other members of the family had to contribute to the family budget by working out by the day. After two years with the lumber company Jim Medford was killed in a logging accident up at Widows' Gap. Though this brought on real poverty, the family would not leave the farm.

1912-1932

As John's six children grew up, all but the two youngest, George and Peggy, had to leave Clay County in order to make a living. Joe and Eddy were drafted into the Army during the First World War. Joe was killed in France just a week before the Armistice, while Eddy spent almost a year in an Army hospital recovering from what was then known as "shell shock." After his discharge Eddy went to Detroit and worked on the Ford assembly line at five dollars a day. Martha and Silvia

were the next to leave, having found jobs as waitresses in a new resort hotel in Asheville. Every month they sent a small amount of money home to their mother. Peggy Medford at the age of eighteen married Leroy Pennington, whose family owned one of the best farms in the county over near the Hiwassee River. The Penningtons were opposed to their son's marrying "poor mountain folk," but Leroy's grandfather, Squire Pennington, overruled the family, claiming that his old friend Tom Medford had been one of the finest men in the county.

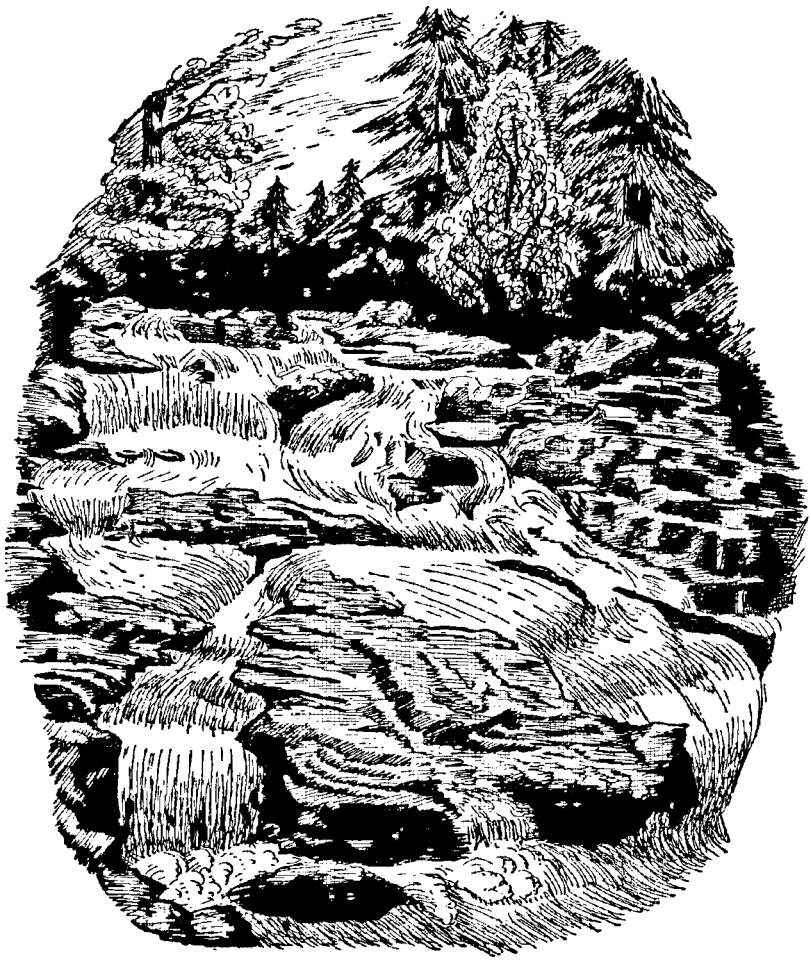
By the time George Medford finished school, his father needed his help on the farm. Prices rose after the First World War, and John Medford again had hopes of making money on his seventy-five acres. Less than one-third of those acres were fit for cultivation, for what had once been the timbered western slope was now abandoned to broom grass, and the winter rains washed the red clay from the gullies into the little brook. As far as George was concerned, that slope had always been like that. Perhaps the gashes on the hillside were deeper and wider and a few more loblolly pines had started to sprout on the ridge, but to George the appearance of that hillside was only another part of those familiar surroundings that for him meant home. As he came up the path from the barnyard on summer evenings and the last rays of the sun turned the broom grass into a golden haze and the shadows in the gullies became a deep wine red, he often thought how pretty it was.

After three good seasons on the farm John Medford, along with one or two neighbors, had saved enough to go into the new business of selling cream. Once a week the company truck would back into the barnyard to pick up the two gallons of cream that had been cooled in the little springhouse near the brook. The monthly check for twenty-eight dollars finally paid for the cream separator and the two Jersey cows that they had bought to get started. Then came the question of pasture and hay to carry the stock over the winter. It was then that they

fenced in ten acres of the western slope, and twice they planted it in timothy and clover. George finally persuaded his father to let him broadcast some commercial fertilizer before the second seeding, but the old man's prediction came true: "Yer granpaw and I tried to raise some grass around here long 'fore you was born. My father said it wouldn't grow and he was right. Now all that nitrate you bin chunkin' around won't change it none. Around here, grass will only grow where it's a mind to."

The next winter was a hard one, and the two Jerseys grew leaner and thinner, munching the frozen stubble. Long before spring the Medfords had to buy fodder from a farmer near Hayesville. By the time this had been paid for, John Medford was disgusted with the cream business, and when one of the Jerseys went dry he told the truck driver never to stop at his farm again. That was John Medford's last attempt to make a living from the farm. George continued to do the routine chores, while his father spent most of his time hunting and fishing. At least this provided a change from the steady diet of salt pork, which was the only meat the family could now afford.

The first real understanding that the world outside of the Tusquittee Mountains was held in the grip of a desperate depression came when Martha and Silvia were no longer able to send any money home. Four months later they wrote asking George to meet them at the bus stop in Hayesville. On the way home they explained that the resort hotel had gone into bankruptcy, and after spending all their savings looking for other work in Asheville there was nothing for them to do but come home. George's family now filled one of the cabins, and the two sisters had to crowd in as best they could. The last to return was Eddy, who drove into the barnyard one winter evening in an old rattletrap Buick, proudly boasting of how he had nursed it over the seven hundred miles from Detroit.



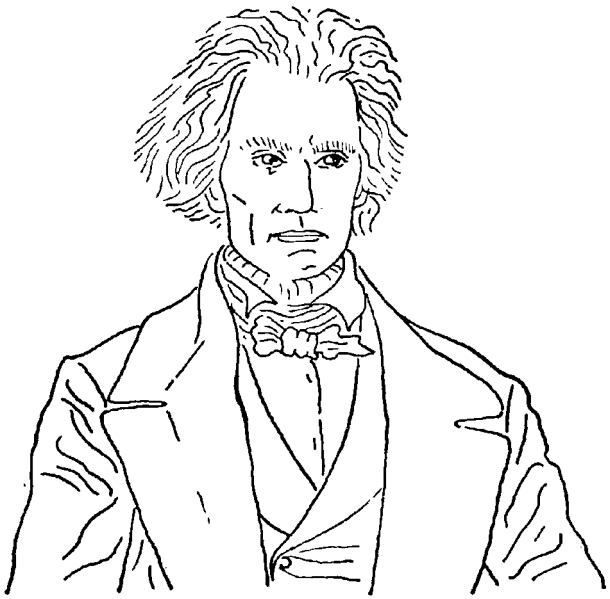
For a time John Medford enjoyed having his children with him again, and the loneliness that he had felt since the death of his wife five years before seemed to disappear. But soon it became evident that the farm could no longer support so large a family. George gave up taking what little farm produce there was to Hayesville. The stores were overstocked and would not barter staples for the eggs and butter that George carefully carried in on the wagon seat beside him. This did not mean

starvation for the Medfords, but it often resulted in long periods of actual hunger. As the head of the family, old John Medford instinctively turned to the wilderness for food with the same grim determination as had his pioneer forefathers. But game was scarce and the long hunting trips that he took into the distant mountains were no longer for sport.

The isolation and idleness made Eddy more and more restless, and after six months of quarreling with his father he told George he was leaving, job or no job. Somehow he got the old Buick started, borrowed all the cash that his brother had, and, while John Medford was away on a hunting trip, left the county for good.

John Medford was never gone for more than two nights at a time, and on the third day of his absence George notified the neighbors in the valley. By dawn a dozen men were combing the Tusquittee range in hopes of finding the old hunter. After four days the search was abandoned. It was agreed that John Medford must be dead. Four months later a Forest Ranger drove into the barnyard and showed George a rusted weather-beaten rifle that he had picked up on a forsaken lumber trail over in the Nantahalas. It was his father's, and George carried it back to the cabin and hung it over the mantel piece along with the other old guns that had belonged to his grandfather and to his great-great-uncle Thomas Medford.

John Medford left no will, and as Eddy never returned to claim his share George became the sole owner of those seventy-five acres. As a stretch of virgin forest, those acres had been only a promise to Thomas Medford when he settled there. For his nephew Jim, they were a speculation, a gamble, first in tobacco, then corn, then lumber. For John, they were a refuge, though poor and forsaken. Somehow George managed to raise his two sons, Bob and Charley, on that land, and it was their generation that brought the real changes to the farm. This part of the case history comes later.



V: Stuck on the Shoals

A Century of Debate

ARCHAEOLOGISTS tell us that a certain tribe of aborigines lived near Muscle Shoals and that the millions and millions of freshwater mollusks clinging to the rocks formed their main source of food. This explains the great mounds of shells found near the Shoals. Right up until Wilson Dam was completed in 1925, these muscle shells were gathered each year and used for the manufacture of small mother-of-pearl buttons. Outside of this, the Shoals remained a threat and a hazard. They were first mentioned in the halls of Congress in 1824, when John C. Calhoun, then Secretary of War, declared that the Shoals were a national problem and the concern of the federal government.

What the federal government should do about Muscle Shoals became the basic theme of a debate that lasted for more than a hundred years. Everyone knows that it takes time for a truly democratic government to reach a decision. This has led some friendly critics fondly to liken the great ship of state to a barge, which inevitably gets there but on the way is swept forward and back by the changing currents of public opinion. In this instance the democratic barge was, in truth, hung up on a rocky problem, and as it hung there one problem piled up on top of another. Throughout this long period the federal government's plans and projects for dealing with Muscle Shoals became more and more complicated, as each succeeding survey was reported by the engineers and technical experts. It now appears that the debate was carried on in three stages, as follows:

Stage 1. Navigation. Question: Can the federal government build a navigable channel from the Ohio to Knoxville, and should the river traffic go over or around Muscle Shoals? Discussion time: Seventy-five years (1824-1899).

Stage 2. Navigation plus Hydroelectric Power. Question: Can the federal government manufacture and sell electric power? Discussion time: Twenty-six years (1900-1926).

Stage 3. Navigation plus Hydroelectric Power plus Flood Control and Conservation. Question: Can the federal government plan and develop the full regional resources of a river system and its surrounding drainage basin? Discussion time: Eleven years (1922-1933).

Around the Shoals

Four years after Calhoun introduced the problem of navigation on the Tennessee River, Congress ordered the Army to make its first survey of Muscle Shoals. In time, they reported back that, whereas the geologic formations upstream and

downstream were all too easily washed away, the rock barricades and ledges of the Shoals were made of the hardest flint that seemed impervious to erosion. Therefore any attempt at blasting a channel through the Shoals would be difficult, and their recommendation called for a canal that would bypass them. The plans were accepted and the project was carried out, but, as already indicated, the river took its revenge, and after the third flood the canal became practically useless, being choked with silt and debris.

During the fifteen years of the Civil War and Reconstruction there was little talk of Muscle Shoals in Washington, but, following another series of surveys and reports, a second canal around the Shoals was started (1875). It took fifteen years to build and, outside of giving Captain Goethals a practical training in canal construction, which he put to good use later in Panama, this second canal did little more than the first, as far as making the Tennessee River navigable.

Wilson Dam

At the turn of the century Muscle Shoals was recognized as an ideal site for the generation of hydroelectric power. The old question of how to get the steamboats up to Knoxville had become somewhat stale, but now something new had been added to the debate. Every year petitions were placed before Congress by private concerns, demanding the right to harness the great potential energy that was pouring down the Shoals. Stimulated by these vast possibilities, the flow of words in Washington nearly matched the flow of water. In 1906 the Muscle Shoals Hydroelectric Company was formed and made the concrete proposal of building three dams across the river for the generation of electric power. This proposal included plans for navigation, but Washington remained irresolute and deferred action.

Nine years later Congress passed a new Rivers and Harbor Act in which it was directed that Muscle Shoals be restudied and a plan drawn up that would combine navigation and power development. It was now clear that they had to be considered jointly and not as separate projects. Once again the Muscle Shoals Hydroelectric Company's proposals were up for consideration, and in May of that year the local representatives and politicians invited those Washington congressmen and senators who had entered the debate to come down to Alabama and take a look at the very spot that they had been talking about for such a long time. A steamboat was hired, and the Washington celebrities were royally entertained all up and down the river.

That was in 1915, and while this happy party was going on the German submarines were disrupting commercial shipping over a wide area of the Atlantic. Up until this time the manufacture of explosives in this country had depended on Chilean nitrate, and Washington was well aware that this supply line might be endangered. Meanwhile our chemical engineers had perfected a method of drawing nitrate from the air—the only difficulty being that it required large amounts of electric power. The next year, in 1916, under the authority of the National Defense Act, Woodrow Wilson picked Muscle Shoals as the site "for the production of nitrates or other products needed for munitions of war and useful in the manufacture of fertilizers." The act also stipulated that the dams for generating the electric power and the plants for producing nitrates should be owned and operated by the government "and not in conjunction with any other industry or enterprise carried on by private capital."

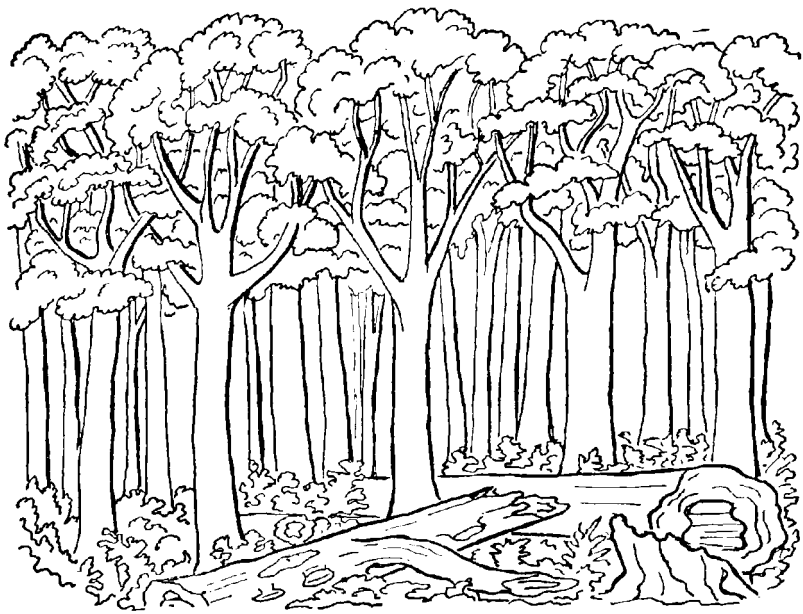
Construction on the main dam and the two chemical plants was started immediately. The plans called for a dam that would raise the water 100 feet, backing it upstream 15 miles, and thus turning the most dangerous part of the Shoals into a

still reservoir. The two tandem locks were designed to lift the river craft 90 feet, and the estimated power production was to exceed 300,000 kilowatts. Wilson Dam, as it was later called, was a bold undertaking on the part of the government and even today, after a generation of dam building, its mile-long colonnade of arches, rising 137 feet, makes it one of the largest and most impressive dams on the main river.

During the ten years of its construction, Wilson Dam and the two chemical plants were still the subject of congressional debate, as well as the victim of party politics. When only a third finished, Congress lost heart, choked off the funds, and looked with favor on Henry Ford's bid to buy the whole kit and caboodle for five million dollars. At this point the entire country joined in the debate, and Muscle Shoals became a national issue. One side maintained that only private enterprise should and could manufacture and sell electric power, while the other held that only the government could handle such a vast project, justifiably begun as a war measure and now held in reserve as part of a national defense program.

Then a new voice was heard in the discussion. Senator George W. Norris, a progressive Republican from Nebraska, began expounding the recent doctrines of conservation, and under his leadership those in favor of government ownership won the day. Ford's bid was refused, appropriations for the completion of Wilson Dam were forthcoming, and by 1926, despite the grumbling in reactionary quarters, the federal government was manufacturing and selling electric power at Muscle Shoals.

The debate now reached its third stage. Muscle Shoals was no longer the focal point of controversy. With the new concepts of flood control and conservation the whole drainage basin of the Tennessee River was carefully studied by the technical experts as a single problem. What their conclusions were and how they arrived at them requires a chapter of its own.



VI: The Big Wheel

Nature in Balance

COLONEL JOHN DONELSON and his party floated a thousand miles through what we today would call either a primitive wilderness or a virgin territory. True, it was not an unexplored region, for the English Colonial traders and the French voyageurs had crossed it many times, and its mountains and rivers, plateaus and plains, had been seen and crudely charted for more than a century. Also, it was not an uninhabited region, for it had been the home and hunting ground of the Cherokee nation long before Columbus left Genoa. Still, it remained a wilderness, primitive or virgin, as you will, in which the forces of nature had never been

disturbed and for untold centuries had maintained themselves in static balance.

What actually is meant by "static balance"? Perhaps the best explanation can be found by taking a closer look at the virgin forests that originally covered most of this area. Fortunately there are still stands of timber in remote parts of the Great Smokies and the southern Appalachians that have never been cut over, and it is an impressive and awe-inspiring experience to walk through their green twilight, surrounded by the beautiful specimens of mature trees whose enormous boles carry them up a hundred and fifty to two hundred feet into the sunlight above. But this is no well-tended sylvan park, for the chaos of giant trunks and limbs rotting on the floor of the forest also plays its part as well as the canopy of green far above. Such a forest is "static," in that it is unchanging in height or extent and the processes of growth and decay remain constantly in "balance" one with the other. Besides this, the virgin-forest cover also acts as an immense insulating blanket, which protects the raw earth from winds and storm, from severe temperature changes, and from the endless washing away or erosion of soil by melting snows and rain. Such a forest is its own protection from change and maintains conditions favorable to its life for countless tree generations.

This natural law of static, or primeval, balance includes all living creatures, and the quantity and variety of game found by the early settlers is another example of nature's constant striving to reach a maximum limit of vitality. Stuart Chase, in his *Rich Land, Poor Land,* gives this excellent summary:

The attainment of maximum vitality is a long, slow process. Each region finds its ultimate balance, which scientists call *climax,* where soil and plant life are at their sturdiest. The forest goes to its limit, both in geographical area and in superior types of trees. In its exuberance it may invade the

prairie. Grasslands go to their limit, invading the desert, developing a climax crop with long roots to tap the underlying water table. Desert and barren areas shrink to the absolute minimum. "A continent undisturbed by man is one of the most abundant life possible."

Who was it, then, that disturbed the primeval balance of the continent? Not the Cherokee nation, for, in truth, they were a part of that balance. A continuing and constant supply of game was their most vital consideration. This required huge tracts of hunting preserve and a carefully maintained ratio between the number of hunters and the hunted. This balance was usually achieved through ruthless tribal wars over the ownership of the hunting grounds. The Indians may have slaughtered each other, but never the animals on which they depended for food and clothing. The increase in game just after the Civil War is a case in point, and it also indicates that these natural laws, or fundamental cycles, affect the civilized white man just as much as the poor savage.

When an extensive agricultural region seems to be singled out for hardship and misfortune repeatedly and, in the course of it, wins the title of "economic problem number one," you can be sure that the forces of nature in that area have been out of balance for a long time. To blame the Civil War, the great flood of 1867, the period of Reconstruction, Muscle Shoals, or the discriminatory freight rates is only to repeat the old mistake of pointing to the symptom and losing sight of the disease. Who then? Surely it is inconceivable to think that Jim Medford could be the villain in the plot. After all, he always seemed to be the victim of the situation. That is true, and yet half a million Medfords going innocently about their daily tasks on the farm, driven from one expedient to the next, could in three generations do more to disturb the balance of nature than all the spectacular destruction of total war. They were the inheritors of a fortune that, at first, as seen by Colonel Donelson and

the others, appeared so limitless, so abundant, and so varied that any thought of conserving it, guarding it, or developing it seemed absurd.

The Hydrologic Cycle

The Big Wheel run by the hand of God
And the little wheel run by the hand of man
Chorus: It's a wheel in a wheel,
It's a wheel in a wheel.
Negro Spiritual

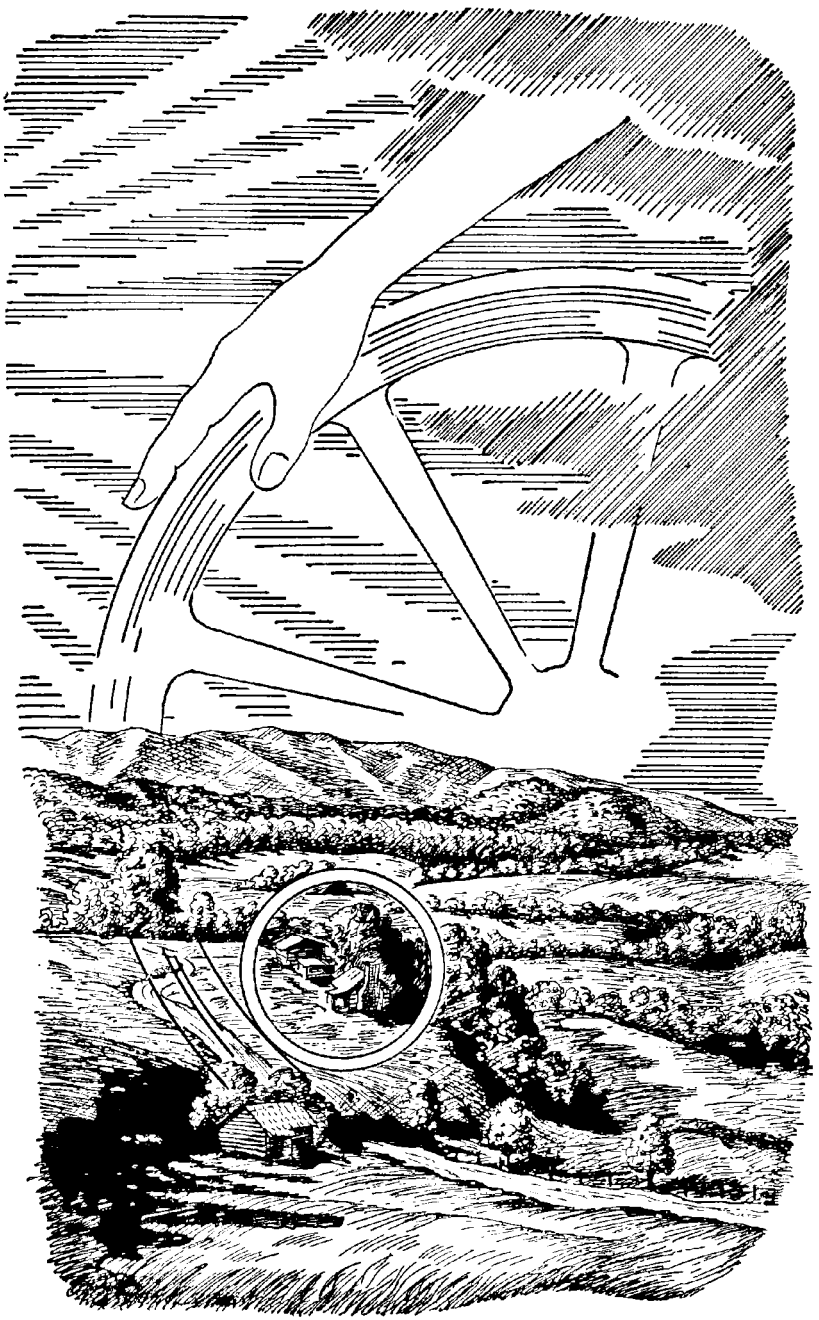
The most precious and basic of all the natural resources in the Valley is the water that falls from the sky onto the drainage basin of the Tennessee River. For the most part, the majority of that water comes into the Valley borne by the warm moisture-laden clouds that constantly move up from the Gulf of Mexico. As these clouds strike the cold air at high altitudes over the mountains, the moisture condenses and becomes rain. In the late summer and early fall another source is apt to be the tail end of a hurricane disturbance that sweeps in from the Atlantic, crosses the Carolina Piedmont, and deluges the high contours at the eastern end of the Valley. Both of these sources add up to an average annual rainfall of fifty-two inches for the whole Valley. Somewhat more than half of this is usually absorbed by the earth or returned to the air by transpiration or by evaporation, the remaining less than half becomes runoff. As one follows the course down the little brooks into the streams, and from there into the tributaries to the main river, and so, finally, back to the Gulf, the outlines of the complete hydrologic cycle become clear. It is, indeed, similar to a big wheel run by the hand of God. This Big Wheel has always turned steadily and swiftly in the Valley, and as long as the magnificent virgin forests protected the soil and minerals,

constantly renewing them, the hydrologic cycle remained in balance with all the forces of nature. But when the "Little Wheel" run by the hand of civilized man began to operate, the same water that had once blessed the Valley and had helped bring nature to its primeval climax now became a plunderer, turning the clear streams into turbulent floods of mud and silt. It had taken the virgin forests thousands and thousands of years to lay down a carpet of topsoil, but as this carpet was exposed to the ever-increasing flow of the runoff of water, it disappeared like snow under a summer sun. Bear in mind that the last hundred and fifty years represent only a split second in terms of geologic time.

One Full Turn of the Big Wheel

To transform a five-acre woodlot into a cornfield requires the hardest kind of physical labor, particularly if your only tools are fire and a sharp ax. After a few weeks of this kind of work a tree becomes your mortal enemy. To the early settlers a heavy stand of timber was a real liability—that is, if you were a farmer clearing land. However, strange as it may seem, in the last two generations this ingrained attitude toward trees has changed and, fortunately for us, before the last one was chopped down. For this we have the conservationists to thank. They pointed out the true rate at which the forests of North America were being depleted, and the startled public began to wonder whether the resources of this continent were as infinite and inexhaustible as the orators of the nineteenth century had always proclaimed. As that century came to an end, and along with it the frontier, the federal government initiated a new policy of setting aside from the public domain large tracts of forest preserve.

This farsighted attitude on the part of Washington came during the administration of Theodore Roosevelt, whose ideas



on conservation were ably backed by Gifford Pinchot, then head of the Forest Service. In ten years' time, through their efforts, it became an established procedure for the government to play the role of guardian angel over those natural resources that were not already in private hands. In 1907 the Inland Waterways Commission was established, and for the first time the great midcontinental river systems were studied, not as isolated problems, but in terms of whole watersheds. Two years later the National Conservation Commission published the first comprehensive inventory of American resources. In 1911 the government set aside large tracts of forest land in the White Mountains and in the Appalachians, some of the latter being on the Tusquittee and Nantahala ranges in which the Medfords often went hunting. Five years later these lands came under the administration of a new agency, the National Park Service.

This concern regarding natural resources indicated an awareness on the part of a few alert, public-spirited men who understood that what was left of our original heritage on this continent must be preserved and that the federal government should lead the way. However, this way was not altogether clear, there being no traditional method of conservation in this country to which one could turn. Those experts who began to study the problem found themselves somewhat in the position of a physician called in to attend a patient who, though young, strong, and exceedingly vigorous, suffers grave lapses of vitality from some hidden cause. Like good professionals, they had to know the true and honest facts first, then, after arriving at a diagnosis, attempt a cure. The scientists, engineers, and technicians engaged in this continental inquiry watched what was happening to the forests and tallied up the staggering and unnecessary losses caused by fire and blight; they analyzed the depletion of soils and noted the effects of erosion; they gauged the underground water tables and recorded the recurrence of

droughts; they measured the rainfall and charted the behavior of floods; they marked the migration of animals, witnessed the extinction of certain species and successfully saved the remnants of others—all of which was just the beginning. As each new report came in and as each new experiment was tabulated, it became more apparent to those entrusted with the formulation of a conservation program that these were not isolated facts. As the evidence accumulated, the close relationship between water, soil, and plant life became clearer. As they watched the revolutions of the Big Wheel and began to understand more about the complete water cycle, they came to some conclusions in regard to all the Jim Medfords busily turning the Little Wheel.

By 1925 conservation had passed beyond the theoretical stage. From practical experience, the experts could now make a few predictions as to what would happen in the Tennessee Valley if people went ahead either wasting the natural resources of the region through ignorance or exploiting them for immediate profit.

First, they warned the lumberman that if he continued to clean-cut the forest (cutting down every tree regardless of size or kind) these forests would never grow back the same and it would be years and years before even the next inferior stand of timber would be ready to cut. They also pointed out that the cut-over slopes in Smyth County, Virginia, could cause not only local flash floods but also endanger the city of Chattanooga two hundred miles away.

Second, they warned the farmer not to grow the cultivated row crops of corn, tobacco, and cotton on sloping ground. Not only would the exposed topsoil, as well as the vital minerals, wash away, but the resulting gullies and scalds would render the land permanently useless. Unless attended to, these sores of erosion would continue to drain mud and silt into the tributaries of the Tennessee River.

Third, they warned the engineers not to try to confine floods behind levees. The bed of the Mississippi had already been lifted high above the surrounding bottom lands, and the river remained a threat even at low water. Flood control in the Valley required reservoirs in the mountains, where the excess runoff started. Canals around shoals resulted only in pockets to catch silt and debris. Navigation demanded a nine-foot channel of slack water, and to achieve this the main river would have to be turned into a chain of lakes, stepped one above the other, with locks for lifting river craft. They pointed out that the right use of the average flow of thirty to forty thousand cubic feet of water per second on the Tennessee River could give that whole region the largest concentration of hydroelectric power in the country.

Fourth, they warned the sportsman that city sewage and industrial waste dumped in the river would kill all the fish.

Fifth, they warned the health authorities that the index of malaria and hookworm was steadily rising.

Their last and most important warning, to all concerned, was that, in effect, all these problems were related and that only through a plan that encompassed the whole drainage basin of the Tennessee River could the resources of that region be fully developed.

The Debate: Third Stage

As mentioned before, the discussion time for the third stage of the century-long debate only took eleven years, but a hundred and thirty-eight separate Muscle Shoals bills were presented to Congress in that time. Meanwhile the Army Engineers were continuously busy making surveys and turning in one report after another. Senator Norris still lead those forces that were in favor of government ownership of all present and future hydroelectric generating plants on the Tennessee River,

and the conservationists also turned to him for political leadership. In 1928 he proposed the building of a large storage dam on the Clinch River not far from Knoxville. The proposal was successfully carried through the House and the Senate, but met an untimely end through a pocket veto by President Coolidge. Like the many-headed hydra, no matter how quickly one Muscle Shoals bill was killed off by those opposing government ownership, another half a dozen appeared at the opening of the next session, clamoring for attention.

After years and years of planning and study, the reservoir of technical knowledge had reached a full head. In 1930 the Army Engineers, under the direction of two native Tennesseeans, General Brown and Major Watkins, came forward with a thorough and all-inclusive plan, published in a 734-page report, entitled *The Tennessee River and Its Tributaries.* Just as Wilson Dam had buried the old rock barricades and ledges of Muscle Shoals under forty feet of water and had turned the most dangerous fifteen miles into a calm lake, so now this broad and comprehensive report buried once and for all the piecemeal schemes and local proposals that had plagued and wearied the lawmakers these many years. This technical document was in reality an engineer's dream, for though it recognized that there existed no legal authority for such an undertaking and that there was no conceivable way for either public or private capital to meet the billion-dollar cost, nevertheless these experts went ahead and clearly outlined just what they, as engineers, would and could do with the Tennessee River and its tributaries.

Franklin D. Roosevelt, when still Assistant Secretary of the Navy, had traveled through the eastern part of Tennessee on his way to Warm Springs, Georgia, and had been deeply impressed by the mountain people and their problems. Also, Roosevelt was a long-time friend of Senator Norris and, following his election, he and the Senator made a late-fall trip to

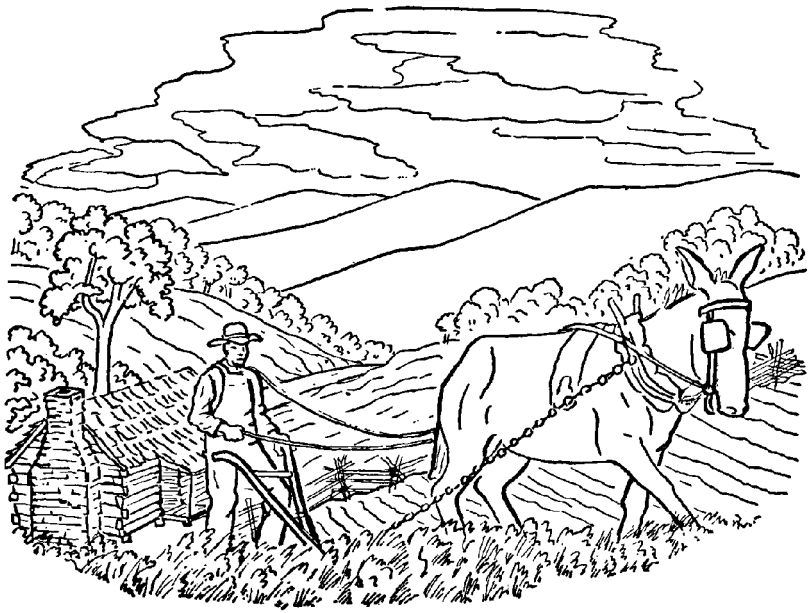
Muscle Shoals. Four months later, as President of the United States, Roosevelt sent the following urgent message to Congress:

"It is clear that the Muscle Shoals development is but a small part of the potential public usefulness of the entire Tennessee River. Such use, if envisioned in its entirety, transcends mere power development; it enters the wide fields of flood control, soil erosion, afforestation, elimination from agricultural use of marginal lands, and distribution and diversification of industry. In short, this power development of war days leads logically to national planning for a complete river watershed involving many states and the future lives and welfare of millions. It touches and gives life to all forms of human concerns.

"I, therefore, suggest to the Congress legislation to create a Tennessee Valley Authority, a corporation clothed with the power of government but possessed of the flexibility and initiative of a private enterprise. It should be charged with the broadest duty of planning for proper use, conservation, and development of the natural resources of the Tennessee River drainage basin and its adjoining territory for the general social and economic welfare of the nation. This authority should also be clothed with the necessary power to carry those plans into effect. Its duty should be the rehabilitation of the Muscle Shoals development and the coordination of it with the wider plan."

On May 18, 1933, the act creating the Tennessee Valley Authority was passed by Congress and signed by the President.

This ended the long debate as to what should be done about Muscle Shoals. There still remained many vital legal issues that would have to be settled, but the great ship of state, or the homely barge of democracy, again floated on the broad flood of popular approval, setting out on the new and, for America, uncharted course that led on toward the first planned resource development of an entire region.



VII: The Tennessee Valley Authority

"Lay bare thine arm; stretch forth thy rod."

Clay County, May 18, 1933

ON THAT clear May morning George Medford was busy laying off furrows with a bull-tongue plow in preparation for that year's corn crop. His bleached and tattered blue shirt swung from his tall thin frame as he sweated along behind the plow handles, struggling to hold a straight course over the hollows and humps of the little field. When the blade of the plow wedged itself solidly under a hidden root, the left trace chain snapped and the old mule came to a halt.

George picked up the broken trace and saw that this time it was past mending. He unhitched the mule, leaving the plow standing in the furrow, and started down across the field toward the cabins below. After he had turned the mule into the lot, he did not even bother to look through the pile of old broken harness hanging in the barn. What was the use? He knew that that was his last chain, for he had already mended it three times with baling wire. There was nothing to do till the boys got back from town in the truck, so George sat on the stoop in the sunshine while his sister Silvia stood in the doorway, watching him whittle notches in the edge of the plank that served as a step.

"Corn plantin' time's 'bout passed anyway," said Silvia after a long silence.

"I'd kind've liked to make me a crop up on that I'il field, but I guess it wouldn't 'mount to nothin' anyway, Silvy," replied George, digging at the plank with his knife. The young pigs in the sty near the barn started to squeal, and George looked down in their direction. "Listen to them young 'uns startin' to holler! Go to all the trouble of raisin' a corn crop an' then feed it to them shoats, an' chances are they won't bring no more then than they do now. That's what's got me so puzzled. Seems like the more you do, the worse off you git. Right now I don't see how we all are gonna get through this spell. Oh well—did you notice the blooms on them blackberries? Looks like they'd make a heap this year."

Decatur, Alabama, May 19, 1933

Two men sat fishing on the old broken-down pier that jutted out into the river beyond the gasoline tanks and the weed-choked right-of-way of the unused railroad track. That track was only a freight spur that paralleled the river as far as the enormous gray cotton warehouse, which now stood empty, its huge sliding doors rolled open; swallows zipped back

and forth through the opening, busily building their nests.

"That crappie done took ma bait agin. Jes' too lazy to chomp down on it this mawnin'," said the older fisherman as he deftly lifted his bamboo pole. The dripping line with the gaily painted bob and empty hook swung into his outstretched hand. "Sut, you're a smart fella, what you think about all this TVA authority or whatever it's called? The paper says we're in for it now. Signed and sealed by the President."

"Ya got me, Jake. Can't hurt us none. We're smack on the bottom now. We bin scrapin' it fer some time, but now that the hosiery mill's in bankruptcy we're flat broke. I've been watchin' it comin' for some time. When our banks started foreclosin' on the Johnson plantations I knew we were in for it. Let's see now, the savings bank is number seven to turn up its toes right here in Decatur."

"You're right, Sut. We're just plain busted. I managed right well till the Southern closed the railroad shops—and wouldn't you know? ma two boys lost their jobs at the textile mill jes' two weeks later. Last month the furniture company, over from Atlanta, come and took the parlor sweet right out from under us, clean as whistle. 'Bout half paid fer too, but there warn't nothin' we could do. Now we're settin' on boxes," said the older man with a grin as he tossed his line back into the muddy water.

"Unless that TVA can do somethin' 'bout the price of cotton, I guess the game's up round here. Look at that warehouse. How ya goin' to raise cotton at five cents a pound? Shush, Jake—I know, all you want is a job—but I think I gotta bite."

Signed and Sealed

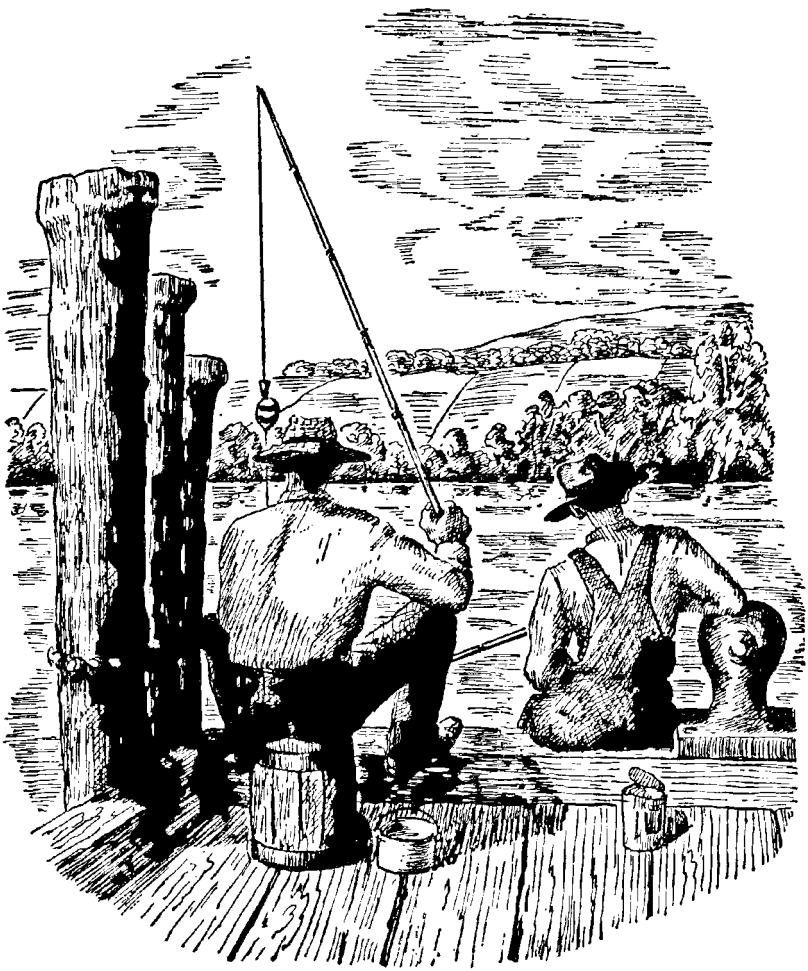
If you had sat down with George Medford and the two fishermen and read through the bill (H.R. 5081) passed by Congress establishing the Tennessee Valley Authority, the chances are

that they would have listened politely but remained utterly unconvinced that it had anything to do with them. That it was a law, drawn up by a group of men in Washington, who had written down a long series of ideas in lawyer's language, and signed by one man and stamped with the official seal of the United States, this they were perfectly willing to admit, but that that piece of paper concerned them personally was just "pie in the sky in the sweet bye and bye." That the Tennessee Valley Authority was charged "with the duty of constantly studying the whole situation presented by the Tennessee River Valley and the adjoining territory, with a view of encouraging and guiding the orderly and balanced development of the diverse and rich resources of that section," meant very little to George Medford. From where he sat on the front porch he could not see any resources either diverse or rich which could be developed.

In spite of the legal language of H.R. 5081, the fundamental purpose of the TVA could be found, clearly and simply stated, in Section 23: ". . . to achieve in the said drainage basin and adjoining territory (1) the maximum amount of flood control; (2) the maximum development of the Tennessee River for the purposes of navigation; (3) the maximum generation of electric power consistent with flood control and navigation; (4) the proper use of marginal lands; (5) the proper method of reforestation; and (6) the economic and social well-being of the people living in the said river basin."

The two fishermen had been brought up on the river and knew it well. They both remembered Muscle Shoals long before Wilson Dam had been built. Jake's father had once driven a team across Bee Shoals after a long dry spell. Sut had never forgotten that exciting day spent warping the steamboat through the "Suck" during a "tide," while on a trip to Chattanooga as a child. From their point of view there wasn't much one could do with that river—either a flood or a muddy trickle.

Well, suppose it was opened for regular navigation, wouldn't that help? Sure, fine, but it don't pay to move five-cent cotton, and that's the only thing round here that was ever shipped on the river. What about electric power? Nothin' nicer if you can afford it, and all the rest sounds mighty good too, Mister, whatever it means, but what we really need is a little steady employment. Say, a job startin' tomorrow. That would be the ticket.



How Much Authority?

Despite any such individual or local reactions, the Tennessee Valley Authority was really something new—new not only for the Valley, but for the lawmakers in Washington. This was not just another bureau or agency set up along the lines of those already in existence. Congress had followed the intention of the President in establishing a government organization that was more in the nature of a public corporation, one that would have "the power of government, but possessed with the flexibility and initiative of private enterprise." Those congressmen who were concerned with drawing up the bill had previously studied the Army Engineers' report on *The Tennessee River and Its Tributaries* and understood the magnitude and complexity of the engineering undertaking that this new Authority would have to carry forward. Its accomplishment would entail heavy responsibilities, and it was evident that the public corporation entrusted with it must have the necessary authority and "power to carry these plans into effect."

The ultimate responsibility and final decision on policy rested in a three-man board of directors. They were to be appointed by the President and to report directly to him and to Congress, but they were free to design and initiate those policies that they felt were necessary for the fulfillment of their task. As a corporation the TVA had no capital, and the construction program was dependent on funds received from Congress, but this did not mean the usual red tape of government contracting or the restrictiveness of government auditing. The TVA was free to hire and fire without benefit of the Civil Service. It was free to work with local communities, with state institutions, and with federal bureaus and agencies. It was free from political interference. But, most important of all, it was free to set up its headquarters in the Valley and not be crowded into one of the

government buildings in Washington. By having its administrative offices within the region in which it worked it avoided the usual problems of remote control and definitely limited, as well, the possibilities of "buck passing."

The President was not long in choosing the first three board members. Arthur E. Morgan, then president of Antioch College, was appointed chairman. His professional training was that of civil engineer, and he was a recognized expert on flood-control problems through his work on the Ohio River. He was a true conservationist, not only in natural resources as an engineer, but also in human resources as an educator. The second member was Harcourt Morgan, an expert on the chemistry of soils who had intimate knowledge of the local problems of agriculture within the Valley. The third member was David Lilienthal, a young and progressive lawyer and administrator, thoroughly versed in the intricacies of the public utility industry in this country. While the two Morgans forged ahead, one with the construction projects on the river and the other with the conservation program on the land, the legal member of the board, through brilliant rearguard action, protected the whole undertaking from judicial sniping, injunctions, and court proceedings.

That the United States government should undertake large and extensive engineering projects was not unusual. The Panama Canal stood as a practical example of its ability to carry through such schemes. Boulder Dam, one of the highest dams in the world, was already rising in the canyon of the Colorado River. However, the challenge in this case was somewhat different. Not only did the plan call for the regulation of the flow of water in the Tennessee River system, but it also designated that something be done about the economic and social well-being of those living in the Valley. Here was a kind of planning that had never been attempted before by the federal government. Here was an engineer's dream that might take twenty or thirty years to complete, and until it was finished no one could tell

whether the floods would be controlled, whether the nine-foot channel would become a great artery of traffic, whether the millions of kilowatts would be put to useful work, whether the worn-out land and the submarginal farms ever could be made into prosperous, self-supporting, self-respecting communities. The critics and skeptics cried, "No," but fortunately these individual expressions of fear and uncertainty were lost in the larger anxieties brought on by the depression. Their warnings went unheeded as the popular attention focused on a new and more hopeful future.

Besides, this was not the type of thing that once undertaken could easily be put aside. People can change their minds about matters like prohibition or universal military training and no one is held responsible. That type of social legislation can be repealed, and, once over, it can be marked down with a smile or a shrug as just another "noble experiment." But a series of half-completed or abandoned dams would always stand as a symbol of failure, the visible demonstration of some gigantic mistake. No individual and no political party could tolerate such a constant reminder of a loss of faith. The three board members were fully aware of these stern realities, but this did not keep them from getting on with the job.

Within eight months the two Decatur fishermen were hard at work on the Wheeler Dam. Jake became a tool dresser and made seven dollars a day, while Sut was employed as a cost accountant and received twenty-four hundred dollars a year. It took another six years before the TVA had worked its way up the Hiwassee tributary and into Clay County, putting George Medford and his son to work on the construction of the Chatuge reservoir. However, a great many things had happened to George and the rest of his family in the meantime.

VIII: Designing a New River

The First Three Years

ALONG with the authority and funds given to the TVA by Congress, all government installations on the river came under its administration. These included Wilson Dam and powerhouse, the two Muscle Shoals chemical plants, and the Hales Bar Dam, completed in 1913, thirty miles below Chattanooga. Also, the Army Engineers turned over their plans for two more dams—one at Cove Creek (Norris Dam) and the other at Wheeler's Landing. The TVA became the custodian and operator of these public works. It also became the custodian of an increasingly temperamental river. During dry seasons the Tennessee River would shrink to a depth of only four feet between Muscle Shoals and the Ohio; above Wilson Dam pool, as far as Chattanooga, it would stand at three feet; and from there to Knoxville its one-foot depth would barely cover the creek cobbles in the bed of the stream. Then, in six months, like a swollen bully, it would gang up with the Ohio, the Missouri, the Red, and the Arkansas Rivers, adding its 20 per cent to the flood crest that swept south to threaten the levee system of the lower Mississippi.

Within the first year construction had started at both the Norris and Wheeler Dam sites. New contracts were being drawn for the wholesale distribution of electric power generated at Wilson Dam. The city of Tupelo, Mississippi, was the first municipal customer, and Alcorn County became the first rural cooperative to tie in with TVA's transmission lines. It was a busy time, and the tempo of those first three years of the Authority's existence was swift and vigorous. As Davidson points out: "To bring into being a force of competent administrators, engineers, and experts for all its multiple purposes,

while simultaneously pushing ahead two enormous tasks of construction, was in itself a tremendous accomplishment, which might have daunted or defeated lesser men." [1]

There are eight sluiceways through the Norris Dam, and just two and a half years after construction started the enormous, vertical sliding gates that close these sluiceways were lowered into position. At the height of operations more than three thousand men were employed day and night to erect this clifflike block of cement, towering two hundred and sixty-five feet above the old stream bed. On the crest of the dam's spillway stand three flood-control gates fourteen feet high and a hundred feet long. If necessary, over two hundred thousand cubic feet of water per second can be discharged over the spillway—a man-made flood that compares well with anything created by nature. The many stories and photographs of the building of Norris Dam caught the popular attention and fired the imagination not only of those living in the Valley but of the millions of interested citizens throughout the country. After the stagnant years of the depression this activity was exhilarating, and the fact that the project was huge in scale, modern in design, bold in conception, and was executed with a bustling enthusiasm, revived one's faith in the American way of doing things. No better monument to Senator Norris, "the father of TVA," could have been conceived.

The Big Decision

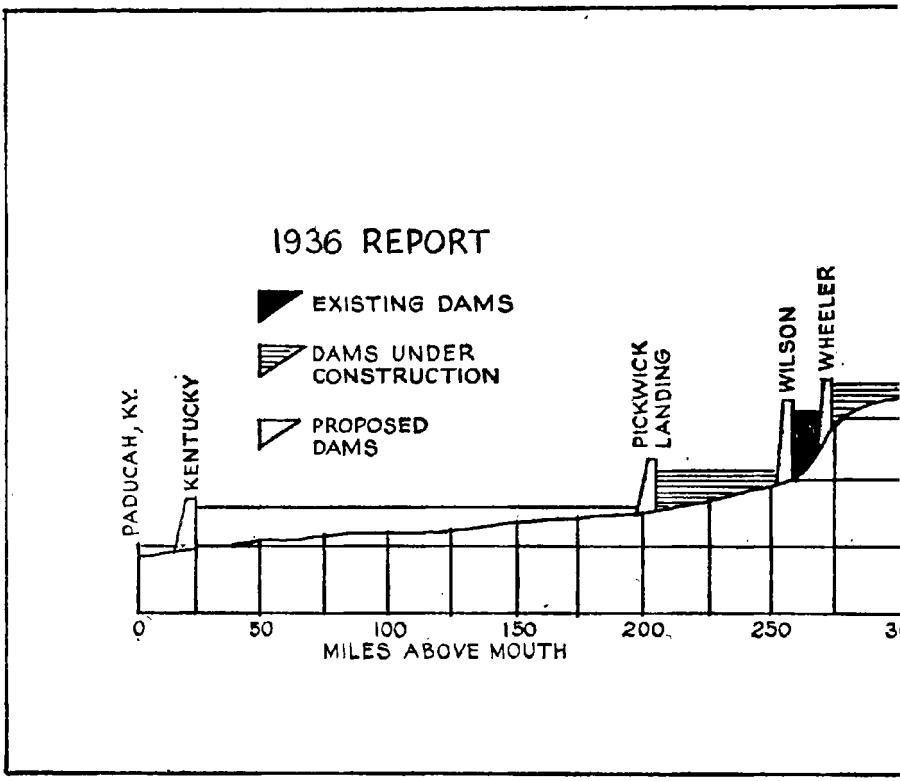
It was inevitable that the swift pace of accomplishment as set by the TVA during those first years could not be maintained. Soon the Authority found itself faced with a most difficult decision. The engineers' original plans for controlling the river included two possible schemes: either a string of thirty-two low dams or a series of nine high dams on the main river,

[1] Davidson, *Tennessee.*

more or less similar to Wilson Dam. It was impossible to go forward until this basic question was answered, and Congress sternly demanded that the TVA make up its mind as to the best unified development of the Tennessee River.

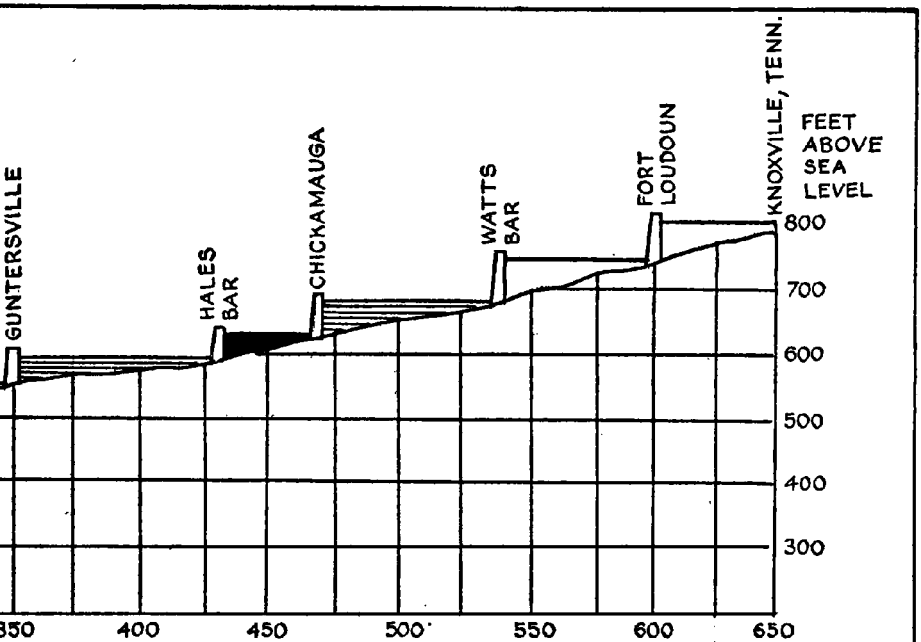
Simply, the alternatives were these. The low dams would provide a fairly good navigable channel, their cost would be moderate, and they would submerge very little adjoining land; but they offered no assurance of flood control or the generation of hydroelectric power. On the other hand, the high dams brought up grave problems. They would inundate hundreds of thousands of acres of farm land in the Valley, and along with this whole villages and monuments and churches, and their cemeteries might then lie many feet under water, for they would suffer a permanent man-made flood far worse than anything ever known. It would mean the relocation of thousands of people, the building of new railroads, motor highways, and bridges. Over against this cost in dollars, ill will, and the resulting human distress at having to leave hearth and home, could be placed the advantages of an inland artery of traffic, the control of floods, and the maximum generation of electric power. Here was responsibility of a high order. After much lonely soul-searching the TVA brought forward a plan for nine high dams on the main river, including the Wilson and Hales Bar Dams.

From here on there was no turning back. Engineers have been called "the enemies of error," and these particular specialists were well aware that if their calculations were inaccurate and they had misjudged the power and cunning of the Tennessee River, the whole undertaking could well become the greatest technological fiasco of the century. The TVA's report, *The Unified Development of the Tennessee River System* (1936), sets forth simply and clearly a comprehensive plan to carry forward the specific requirements and the general purposes of the original 1933 TVA Act.



In its broadest and simplest outlines, this plan for the development of the Tennessee River called for nine high dams between Knoxville and the Ohio, which would be placed as indicated on the chart. All of these dams would be multipurpose dams—that is, (1) they would fulfill the purpose of navigation by backing the water up to the entrance of the locks of the next dam upstream, at a minimum depth of nine feet, and these locks would lift or lower the river craft from one side of the dam to the other; (2) each dam would be equipped with flood-control gates, so designed that the height of water above the dam could be regulated even during flood periods; and (3) all dams would be equipped to generate electric power.

The plan also recommended that two more flood-control and power dams, similar to Norris, be built on tributaries to the



PROFILE OF TENNESSEE RIVER

main river. One of these, to be placed at Fowler's Bend, North Carolina, would store the excess runoff of the Hiwassee watershed, which included the Nantahala and Tusquittee ranges in the southern Appalachians. This Hiwassee project would also play an important part in protecting Chattanooga from floods. The other dam was to be placed on the Little Tennessee River just across the state line at the foot of the Great Smokies. This was later to become the famous Fontana project. In connection with these recommended installations in the Valley, the TVA drew up an eight-year schedule for their construction, indicating the manner in which one project should overlap another. "If the projects succeed each other in suitable order, the continuous use of skilled men and of construction equipment can add greatly to the economy of construction."

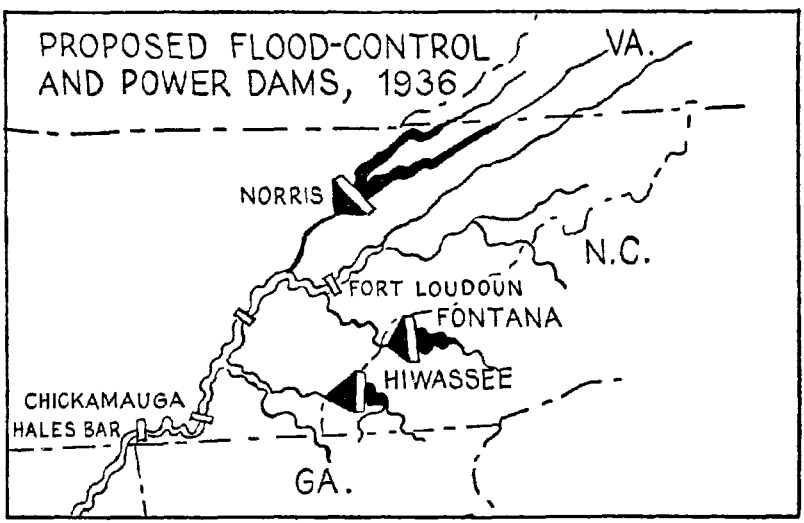
The 1936 plan falls naturally into two parts, both closely related. The part just described pertaining to the dams may be referred to as "Construction on the River," while the other section of the plan, taking into account soil conservation, distribution of electric power, reforestation, malaria control, and recreation, has to do with "Reconstruction on the Land." To make such a division is justifiable only for the sake of simplicity. Actually what happened on the land gave reason and meaning to all the construction on the river, while the controlled use of the river made the reconstruction on the land possible.

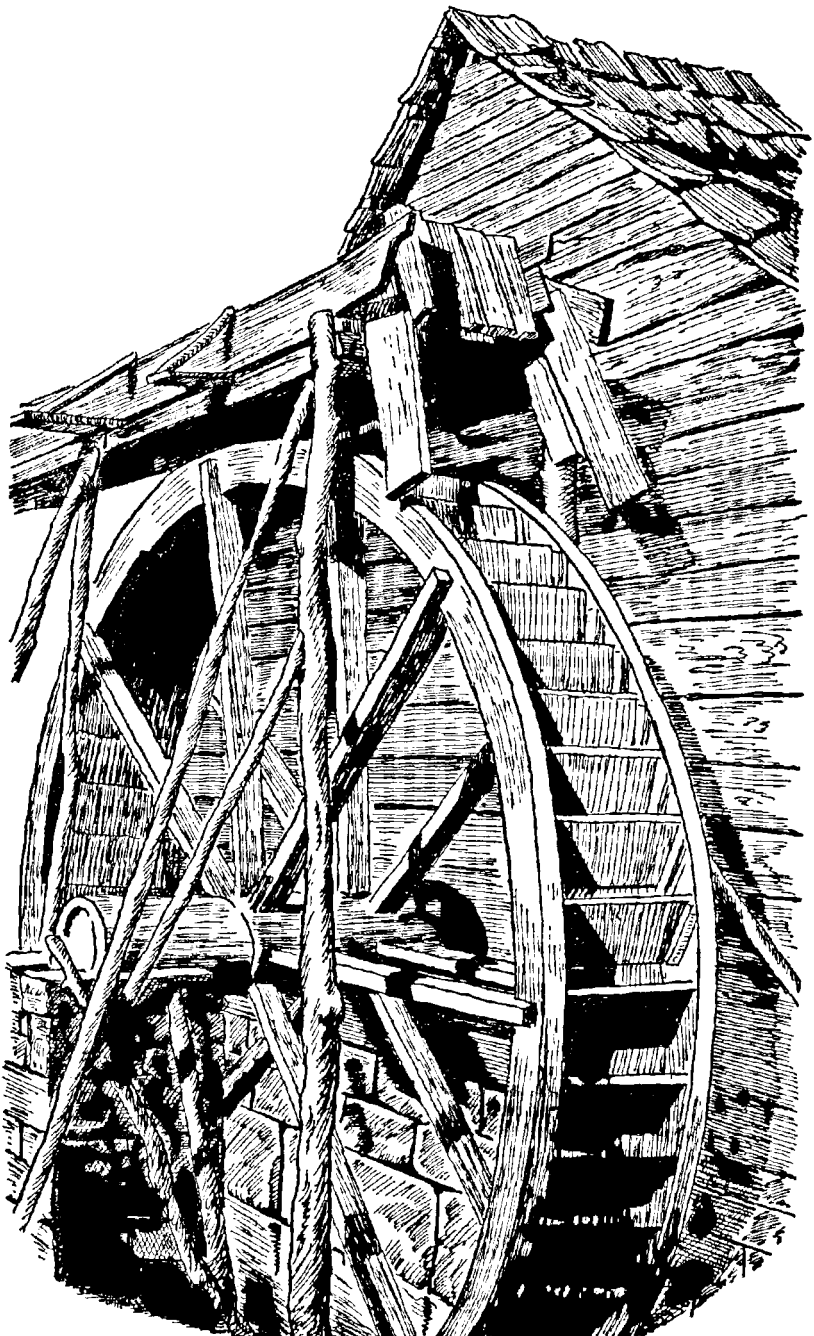
It is beyond the purposes of this book to go into all the details of the highly technical problems with which the TVA had to deal. How the river was transformed into a chain of lakes and how the Big Wheel (hydrologic cycle) was brought into balance through a series of high mountain reservoirs, reforestation, and soil conservation are fundamental to an understanding of what has happened in the Valley. All of this leads us back to the Medfords, who by now had nothing, wanted nothing, and did not seem to care much one way or the other. The TVA knew well enough that unless the Medfords were brought into the plan it would not work. The engineers could carry their calculations to the *n*th decimal point, but without the cooperation of George Medford and the others the river might just as well have been left to its own wasteful and erratic course down the Valley.

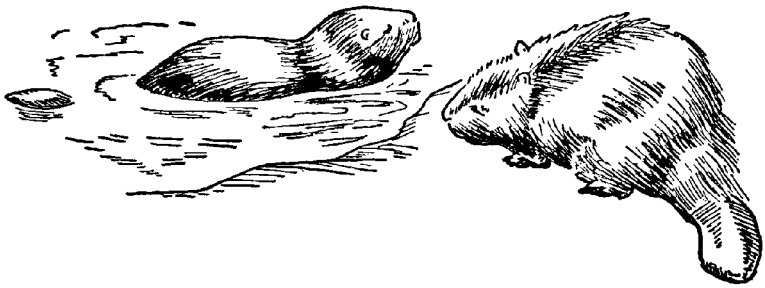
It would be repetitious and unnecessary to describe each of the nine high multipurpose dams on the main river, for in principle, if not in design, they are much alike. Generally speaking, the TVA pushed forward its construction program on the main river before starting up the tributaries, and so we will start with the Chickamauga Dam, which in height and size is about average and which serves, more or less equally, all the purposes for which each of the nine dams was built.

Next will come the Hiwassee Dam at Fowler's Bend, which

is a typical flood-control (or reservoir) and power dam, similar in purpose to Norris and all the other dams situated on the tributaries. Farther up the watershed is the Chatuge Dam and reservoir (no power) in Clay County, which performs the same function as most of the other man-made mountain lakes. Under the heading "Construction on the River" we will take up these three dams in turn, attempting to explain their design, how they were built, and the purpose that they serve in the unified development of the Tennessee River system.





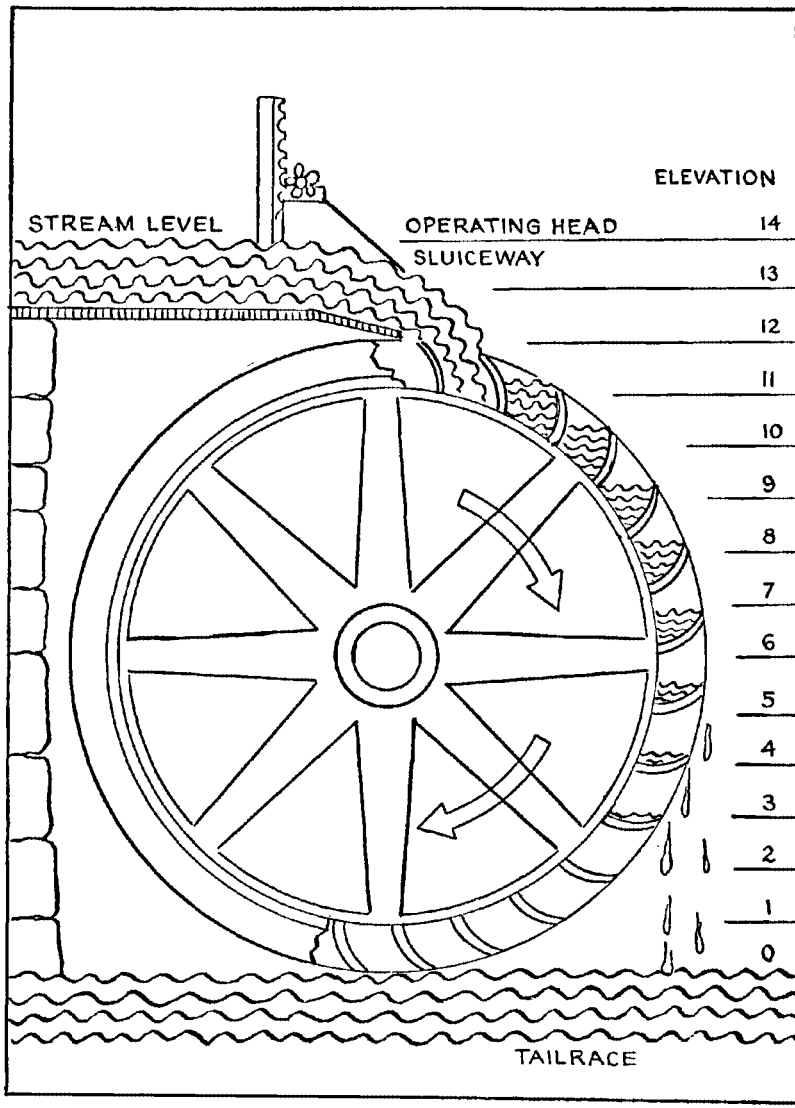


IX: Construction on the River

The Power of Falling Water

MAN'S existence on this planet is dependent on water. Long before he had any idea that his planet was round, he understood enough about the nature of water to know that it sought its own level. By means of a dam, this natural law can be controlled and put to good use. The bathtub stopper when placed over the drain becomes "a barrier to check the flow of water," and in that sense it also is a dam. The truly remarkable thing about a beaver is his ability not only to construct a dam but to keep the water level in his pond from changing. The beaver, being a persevering and skillful hydraulic engineer, is also one of nature's greatest conservationists.

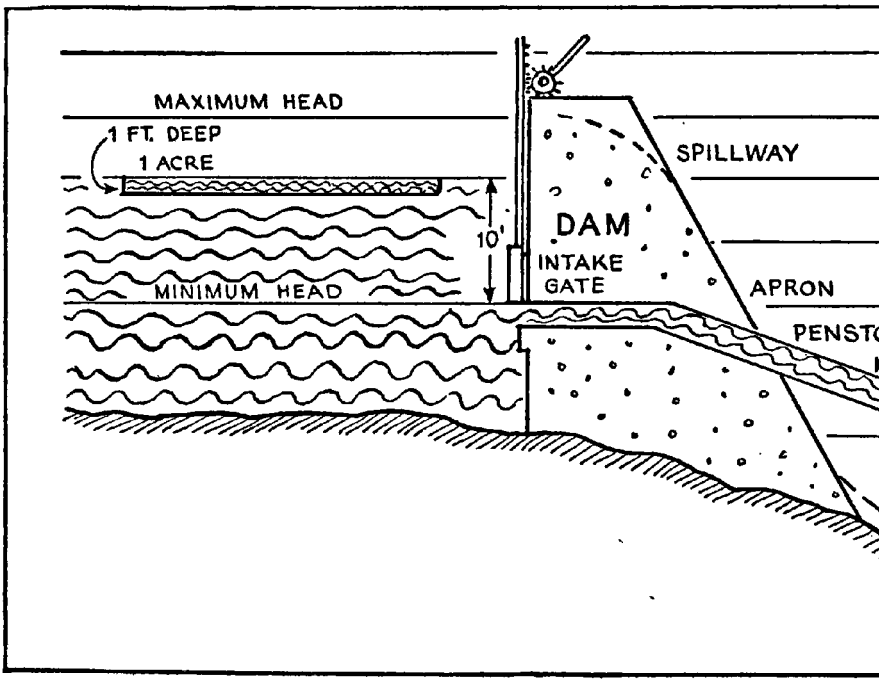
Perhaps the control of atomic energy may displace the use of falling water as a source of power, but up to date the science of hydrodynamics remains one of mankind's most important discoveries. Man's attempts to regulate the flow of water are as old as history itself. The irrigation systems of the Egyptians on the Nile, the aqueducts of the Roman world, the great reservoirs of Ceylon, the solid marble dam, three miles long, built by a Hindu rajah in the seventeenth century—all of these have


ELEVATION
STREAM LEVEL
OPERATING HEAD
SLUICEWAY
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
TAILRACE

contributed to man's understanding of how to control the flow of water. It was only a short time ago that windmills and waterwheels were the only machines, excluding animals and men, that could convert energy to useful ends. A well-built watermill, standing below a solid dam on a dependable stream, became the production center of the surrounding community. It was the power of falling water that first turned the wheels of industry, and as they turned, the Industrial Revolution got its head start long before there was any thought of generating power through steam or electricity.

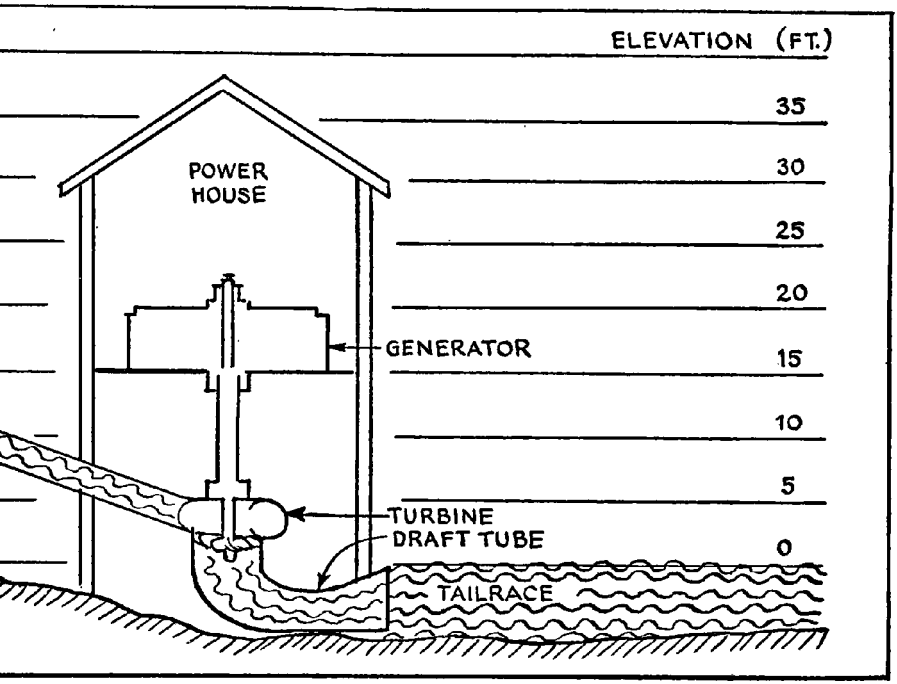
For the sake of explanation, let us forget for the moment there is such a thing as friction. In the drawing (page 94) the water falls 14 feet from its head (stream level) to the tailrace below. Only the first 11 feet of that fall are used in turning the millwheel. Let us say that the amount of water flowing through the sluiceway is 5 cubic feet of water per second (c.f.s.). Since 1 cubic foot of water weighs about 62½ pounds, the water flowing through the sluiceway would produce 312½ foot-pounds each second if it fell 1 foot (5 c.f.s. times 62½ pounds). As it drops 2 feet in the sluiceway and 9 feet on the turning wheel, it will produce 3437½ foot-pounds per second. When a pound is raised 550 feet per second, work is done at the rate of 550 foot-pounds per second, or 1 horsepower. Therefore, leaving aside the unknown factor of friction, the theoretical power derived from falling water, as illustrated in this case, would be a little more than 6 horsepower (3437½ divided by 550).

Of course, in actuality the loss of power from friction and water wastage (leaks) might cut this horsepower figure in half, particularly if all the moving parts are made of wood, as is usually the case. But the most serious defect of such a mill is the fact that there is no water storage. As soon as the stream level drops more than 1 foot, the head of water is gone and the waterwheel will stop. This means that continual operation can



be carried on only if the stream flows at more than 5 cubic feet per second.

In order to arrive at the theoretical horsepower production of this turbine, one uses the same formulas as in the case of the old millwheel. The pipe (penstock) leading to the turbine delivers 5 cubic feet per second. This flow of water, passing through the propeller-like blades of the turbine, transmits its power to turn the vertical shaft. The draft tube below carries the water back into the tailrace. In this case there is a 30-foot head, or the difference in elevation between the level of the water in the storage pond and the level of the tail water. The foot-pounds of pressure at the turbine will be 9375 foot-pounds per second (5 c.f.s. times 30 feet times 62½ pounds), or a fraction more than 17 horsepower. Again, bear in mind that this



is only the theoretical power that such a dam and turbine can produce, for it does not take into account friction, water wastage, and similar factors. Whereas these factors cut the theoretical horsepower of the old millwheel in half, in this second instance the reaction-type turbine (propeller blades) can transmit 80 per cent of the power of falling water.

An old-fashioned grist mill or saw mill that depended entirely on stream flow as a source of power might have to close down during dry summer months. The turbine standing below the storage dam can maintain almost continuous operation, depending on the size of the storage pond and the number of cubic feet per second flowing into it. Engineers measure the capacity of a storage reservoir in terms of acre-feet rather than gallons. An acre of water 1 foot in depth is a more convenient

form of measurement and can be easily translated into cubic feet per second. The storage of electricity in a battery is perfectly practical for an automobile but impossible if one is trying to supply electric power to a whole countryside. Therefore, if the turning shaft of the turbine is connected to a generator, the hundreds or thousands of acre-feet of water above the dam become in themselves a kind of storage battery. When water power is being converted to kilowatts the water stored in the reservoir is then known as "white power."

The Chickamauga Project

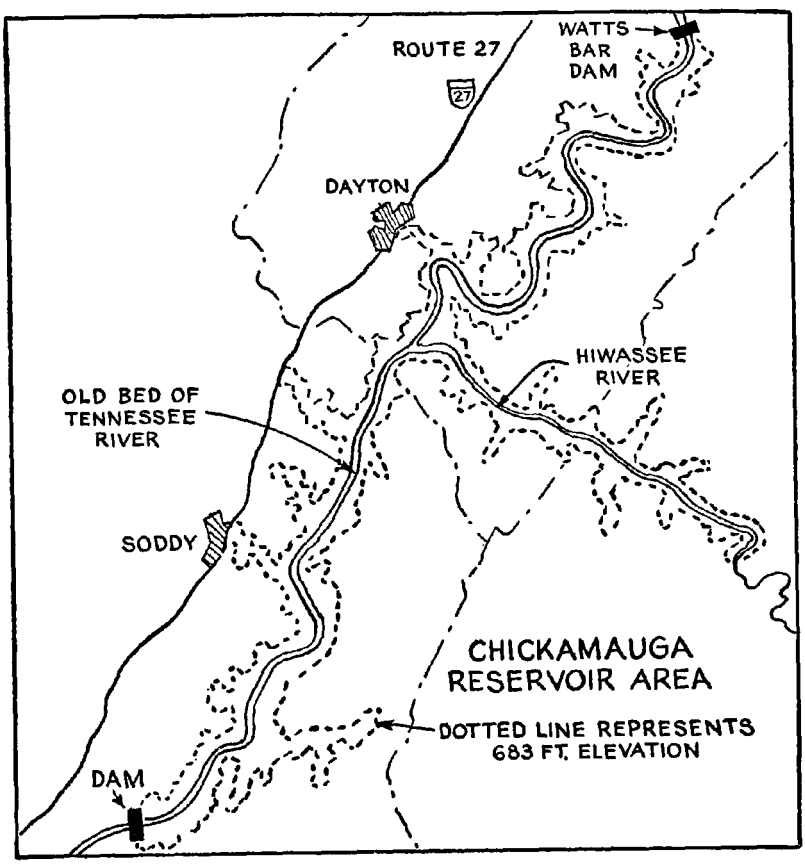
The first Indian attack on the homemade flotilla led by Colonel John Donelson probably took place somewhere near the present site of the Chickamauga Dam. As you remember, those Indians were an outlaw tribe of the Cherokees, and the little creek that flows into the Tennessee River seven miles above Chattanooga still bears their name.

In that first comprehensive report by the Army Engineers in 1930 it had been suggested that a dam be thrown across the river at this location. The Chickamauga Dam was the fourth multipurpose project to be undertaken on the main river by the TVA, and long before the Wheeler, Pickwick, or Guntersville projects had been completed, investigations were being made in preparation for the designing of this new dam. At six different sites borings were made in an effort to find the most stable bedrock base on which to place the axis of the dam. These test borings indicated that the various stratas of rock were very uneven, lying in crumpled folds beneath the river. Where they overlapped one another, there were cavernous seams, or "faults." In this irregular rock structure they found large channels and deep cavities, which would first have to be cleaned of sediment and then "grouted" or filled with concrete in order to assure a secure footing for the dam.

Before the designing of such a dam can be started, a great deal of technical information must be gathered and certain basic problems must be thoroughly considered. It might be interesting to list some of the considerations that followed the preliminary investigations.

1. How high should the dam be? Or to put the question another way: How was the 9-foot channel to be maintained up to the entrance of the locks of the Watts Bar Dam, which would be the next dam upstream, and would this still keep the reservoir within reasonable and economic limits?

The dotted line on the map below represents an elevation of



683 feet above sea level, which would inundate portions of six counties, and would be a crucial factor in the lives of 903 families who would have to be relocated before the reservoir was flooded. Elevation 683 would affect the towns of Soddy and Dayton, as well as making it necessary to build 80 miles of new highway and 39 bridges. Cemeteries, telephone and power lines, would have to be moved beyond the boundaries of the new reservoir. After all these considerations had been carefully taken into account, the best solution of the problem called for a dam 129 feet high and a little over a mile in length. Such a dam would back the water, to a depth of 9 feet, 58 miles up the Tennessee to Watts Bar, as well as 20 miles up the Hiwassee. The 810 miles of shoreline would take in 40,000 acres.

2. What was the flow of water at this point on the river? Half the total area of the Tennessee drainage basin lay above the dam site. Over these 20,000 square miles the annual rainfall was higher, and so the excess runoff was greater, than in the rest of the basin below the dam. About one-tenth of this upper basin was blocked and controlled by Norris Dam. The Hiwassee project would regulate the flow from a 1000 square miles and later Fontana would handle another 1500. Studies had been made of the varying heights of the river and the maximum flow of water on a month-by-month basis over a period of fourteen years. From these figures the engineers could plot the extremely erratic behavior of the river, as well as determine the average mean flow, which would be 35,000 cubic feet per second. This average could jump to 459,000 c.f.s., as it did in 1867, or drop to 3300 after a long dry spell. After considering all aspects of this problem the engineers specified that the dam must be designed with a spillway capacity of 600,000 cubic feet per second.

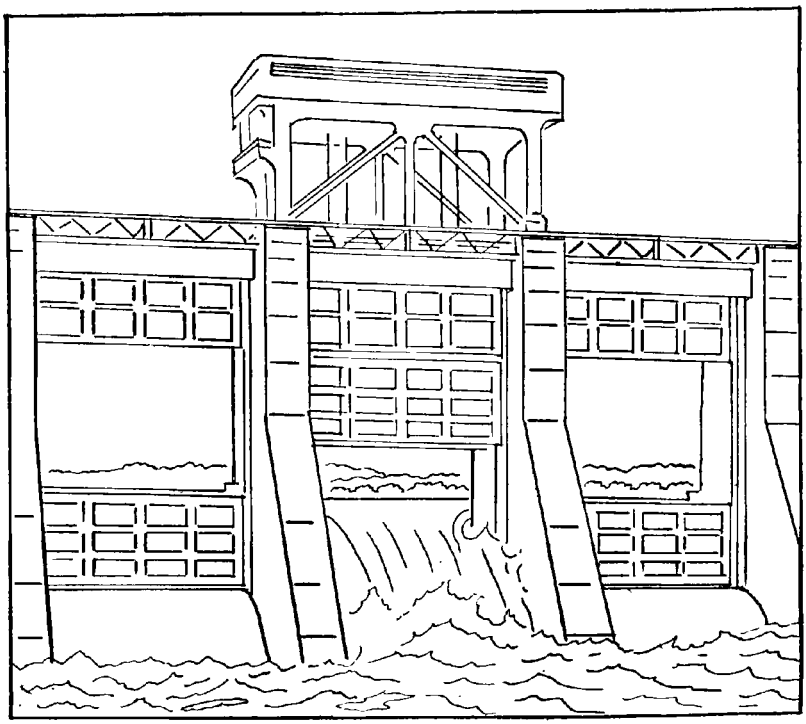
3. What would be the rated kilowatt capacity at this project?

The consideration in this case would have to be based on estimates of the controlled maximum and minimum levels of the reservoir during the extremes of floods and droughts, as well as the normal operating level, when the Tennessee was delivering its average mean flow of 35,000 c.f.s. Again the elevation figure of 683 played an important part. The engineers set the maximum reservoir level at 2 feet above this mark, or 685, with an estimated drop of 10 feet to the minimum operating level (El. 675). In order to retain the 9-foot channel below the dam, the tail-water level would have to stand at elevation 635. These figures indicated that the operating head would vary from 36 to 48 feet. Under these varying conditions the most suitable kind of turbine would be the reaction type with movable, propeller-like blades. Such turbines could deliver 36,000 horsepower at a 36-foot head, and the generator, standing above and spinning on the same vertical shaft, would produce 27,000 kilowatts. The powerhouse should be designed ultimately to accommodate four such generating units. However, the current plan called for the installation of only three units with a rated total capacity of 81,000 kilowatts.

DESIGN

With these general considerations in mind the engineers began the designing of the Chickamauga Dam on paper. These would be the working drawings from which the construction would be done. The navigation lock is located at the northern end of the spillway. The lock chamber is 60 feet wide and 360 feet long and lifts or lowers the river craft as much as 56 feet. The gates and valves are electrically operated, and the water passages, for filling or emptying the chamber, are designed to operate as swiftly as possible, so as not to delay the "locking through" operations.

To design this dam so that it could discharge 600,000 cubic



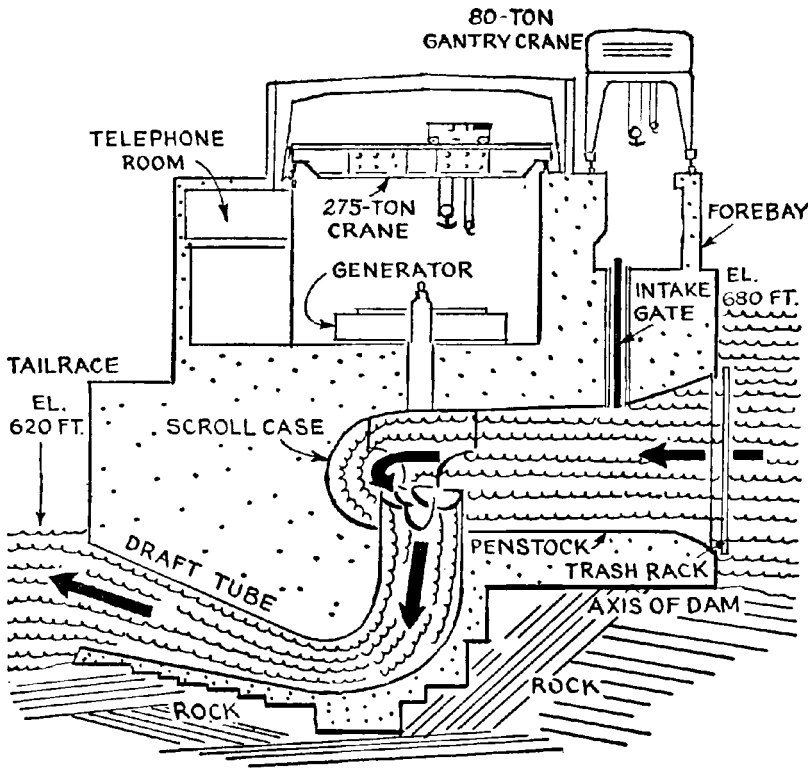
feet of water per second, should such a condition become necessary, required that at least half of the surface area of the dam proper be removed or lifted above the flood to accommodate such a stupendous flow. Nineteen slotted piers, at equal intervals, stand above the crest of the low spillway, which in this instance is only 10 feet above the tail-water level. Into the slots on the side of each of the piers are fitted eighteen vertical-lift, roller gates, each 40 feet wide and 40 feet high. Each gate is in two sections of approximately equal height. These control gates are lifted or lowered by two gantry cranes that move back and forth on the bridge deck at the top of the dam. By raising the gates as high as they will go, this section

of the dam is really transformed into a bridge, allowing the flood, which in this case would be greater even than the one in 1867, to flow underneath, between the 8-foot piers, and, in all likelihood, to inundate Chattanooga and the rest of the valley.

One of the gantry cranes that operate the control gates also opens or closes the intake gates to the powerhouse. On the upstream face of the dam (forebay), each intake opening is protected by a trash rack that catches the debris in the river before it enters the intake leading to the turbine. The water is carried down and around through the scrollcase, which resembles a simplified snail's shell.

A series of guide vanes direct the tons of falling water in a swirling, rotary motion against the five giant propeller blades (runner) of the turbine. These revolving blades run in a circular opening, 22 feet in diameter, through which the water passes into the draft tube below that carries it back of the dam into the tailrace.

The main turbine shaft that supports this huge propeller is 33 inches in diameter and rises 23 feet to spin the arms of the generator standing two stories above. The bearings and couplings on this shaft not only have to support the weight of the runner and the shaft itself (332,000 pounds), but must be strong enough to stand a total hydraulic thrust of more than a million pounds. At 75 revolutions a minute, this turbine can transmit a maximum of 42,000 horsepower. Though this gigantic mechanism is held in place by thousands of tons of steel and a half a million cubic yards of reinforced concrete, as one stands in the visitors' gallery of the powerhouse one can feel a deep, subterranean vibration, as though somewhere underneath there were a chained earthquake. This is only the routine hum of the three units performing their daily task, but it gives one some hint of the terrific forces that are at work below in the bowels of the dam.

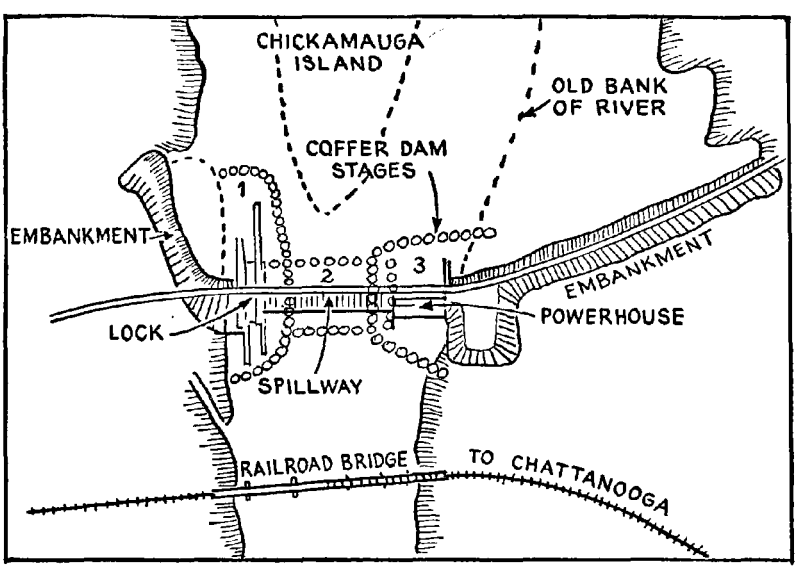


CONSTRUCTION

How is it possible to build a huge dam, with locks, spillway, and powerhouse, across an uncontrolled, flowing river more than a quarter of a mile wide? This is usually the first question that arises in everyone's mind. On a small stream it is simple enough to build a temporary bypass that will handle the stream flow during the few months of construction. But here was an undertaking that took five years to complete, and throughout that period the Tennessee River rose and fell as the rainclouds passed over the 20,000 square miles of watershed, causing a continual fluctuation in water level. The construction of the Chickamauga Dam followed the accepted engineering practice

and was built in three stages, or sections, each stage being protected from the flow of water by coffer dams.

This type of coffer dam is like a stockade made of open steel silos standing close together and enclosing the area in which the construction will take place. The steel staves that form these silos are driven deep into the mud and silt of the river bottom. Each of these hollow cylinders is then filled with the muck and dirt (overburden) that lies within the coffer-dam enclosure. As they are filled, the water is pumped from the enclosure and all leaks are sealed. Having removed the overburden from the underlying rock, the real excavation begins and is carried down until a firm bedrock foundation has been exposed on which the dam can safely rest. On this solid base the forms that will hold the reinforced concrete are erected and the pouring of the cement concrete is begun. These foundations are carried high enough so that when the coffer dam is removed the structure will be well above high-water level. The stockade of silos is



then taken down and reset to form the protective enclosure for stage number two.

As indicated on the plan, the first stage included only the lock and a few bays of the spillway. Not until the lock had been fully completed, with the giant lower gates (72 feet high) hung and tested, the hydraulic machinery for filling and emptying the chamber installed, and the operation and control building finished, was the coffer dam taken down and moved to stage two. In this second stage all of the spillway was built except for three and a half bays nearest the powerhouse. As soon as the high slotted concrete piers, capable of holding the 40-foot square spillway gates, were erected, the bridge above with the track and the two 80-ton gantry cranes were installed. The spillway gates, completely assembled, were picked up from barges on the downstream side by a tall stiff-leg derrick, which swung them high above the dam and then lowered them one at a time into the service slot of bay number one. From there the gantry cranes were able to pick them up and move each gate into its proper slot. Until all the work on the powerhouse, the third stage, had been completed, the gates were raised so that the river could flow under them between the piers.

As you know, the powerhouse was designed to accommodate four generating units, although only three were initially installed. The great elbow-like forms of the draft tubes were fabricated in sections at the job-carpentry shop and then assembled in their correct positions in the foundations of the powerhouse. In order to insure the alignment of the guide rails of the intake gates, two structural steel towers were embedded in the concrete piers that support these gates. Each intake gate, weighing 60 tons, was handled by the gantry crane in the same manner as the spillway gates. Before any of the fixed or moving parts of the turbines could be placed in position, the 275-ton crane had to be assembled and put in operation. This crane

moves back and forth just under the ceiling of the enormous room in which the generators stand. The most difficult part of this installation was the erection of the two 40-ton girders that span the generator room and support the electric hoisting mechanism. From there on, the assembly, alignment, and testing of the three generating units, the completion of the powerhouse, the setting up of the outdoor electrical equipment in the switchyard, and the final grading and finishing of the north and south embankments, or wings, of the dam proper—all were carried through on schedule. This part of the construction followed the well-established engineering procedures that had been successfully used before in building the three preceding main river projects. During those five years of construction, the 60,000 acres that were needed for the new reservoir were acquired and two-thirds of this area was prepared for inundation.

RESERVOIR PREPARATION

More than twelve hundred aerial photographs were taken of 750 square miles that included the site of the Chickamauga reservoir. Accurate elevation maps were drawn, showing all property boundaries, existing structures, roads, lanes, trails, orchards, woods, streams, canals, millraces, transmission lines, railroads, and bridges; in fact, every mark that man had made on that landscape was recorded to scale, and this included not only the cemeteries of the newcomers, but the ancient mounds or burying grounds of prehistoric tribes that had lived there long before the coming of the Cherokees. Everything within that area was now placed in just two categories: either it was 683 feet above sea level or it was not. As the engineers succinctly put it, "The upper limit for complete clearance of buoyant material was set at El. 683 over the entire lower part of the reservoir, including the Hiwassee Valley."

The nine hundred and three families mentioned before were

included in this "buoyant material" and had to be moved from the site of the reservoir. Although the TVA, through previous experience, had worked out as careful and as considerate methods for evacuating these families as could be devised, there still remained the tragic situation of forcing people to leave their homes. Half of these families were living on farms of less than 25 acres, in small, unpainted wooden houses, without electricity or running water and with a cash income of only 300 dollars a year and, when confronted with the desperate problem of finding a new home, they needed all the assistance that the TVA and other local agencies could give them. Actually, the moving of the families living within the Chickamauga reservoir site was less difficult than on other projects. In this case, the families had four full years in which to make their plans and vacate their holdings. Also, the fact that half of them worked in Chattanooga and were glad enough to move to new communities nearer the city made the relocation job that much easier. A great many of the local tenant farmers who for years had been on relief received their first employment either on the construction of the dam or in the clearance of the reservoir.

The only towns affected were Soddy and Dayton. Soddy lost six stores, a grist mill, and eighty-three families. A questionnaire survey was conducted by the TVA in February 1937. It showed that the business future of the town would not be materially hurt since the two previous chief sources of income were employment in the coal mine and hosiery mill, and these enterprises had already been abandoned. Approximately three-fourths of the families were being supported by public relief funds, and purchase of land by the Authority did not necessarily contribute to further disruption of the community. Today Soddy is a pleasant village with the river at its front door, and from the main street one can look out across the Chickamauga Lake. Dayton lost a grammar school, three churches, and a

blacksmith shop, but in return it now has a snug harbor for pleasure craft and has become a recreation center for local fishermen.

RESERVOIR CLEARANCE

The old pioneer skill of clearing land was still traditional with the farmers living in or near the reservoir site. They knew how to sharpen an ax and how to use it, and so, like their forefathers who had made their clearings in the virgin forest, these local woodchoppers moved through the timbered areas, removing all standing trees below the new waterline. As part of the malaria-control program all banks were cleared of brush and saplings and all low places were ditched so that no stagnant pools would be left when the water was withdrawn to its minimum level. By the fall of 1939 eight public parks had been laid out on what would become the shoreline, a large fish-rearing pond had been built, and half a dozen enclosed harbors for pleasure craft had been dredged. At last the reservoir was ready to receive its man-made, permanent flood of 700,000 acre-feet of water. The spillway gates were lowered the middle of January. The first effective flood control began that spring, and by March one of the hydroelectric generating units was in operation. That July the powerhouse was running at its full rated capacity. During the five years that it took to build the Chickamauga Dam, the Tennessee Valley Authority, following its well-planned and synchronized construction schedule, brought many other projects, like the Wheeler, Pickwick, and Guntersville Dams, to completion. At the same time TVA carried on its preliminary investigations, drew its designs, and deployed its army of construction workers and their equipment to the new sites of the Hiwassee, Fontana, and Watts Bar projects.

For the most part, this army of workers that moved from project to project, up and down the Valley, were local residents.

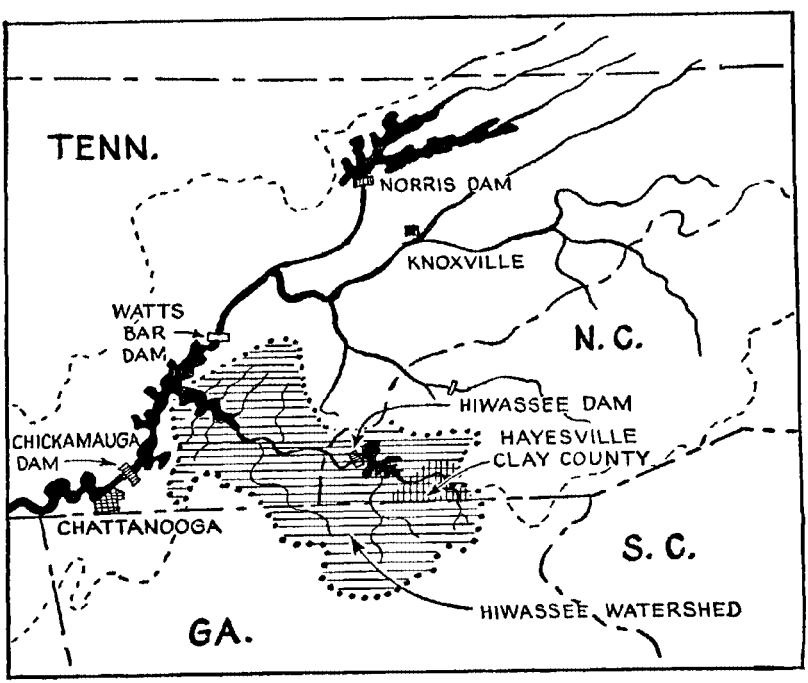
There were some that started as skilled workmen, like Jake, the Decatur fisherman, who was hired as a tool dresser after twenty years' experience as a machinist in the Southern Railway's repair shops. Others came straight from the farm, particularly the younger ones, with nothing more to recommend them than their indigenous knack of keeping some old worn-out jalopy in running condition, but after a few months of work behind a coffer dam they wore their tin hats and rubber boots like veteran dam builders. These native construction workers played a vital part in changing the flow of water in the Tennessee Valley, and in doing this they not only received their much-needed wages, but they also had the experience of working cooperatively with other men, taking pride in their new skill or craft, and sharing the responsibility for the competent accomplishment of their particular job. Though later they might return to their lonely hillside farms, the time spent as dam builders would not be forgotten, and the old traditional habits of withdrawal and isolation were usually replaced by a sense of interest in and concern for their little communities, no matter how remote.

Controlling the Hiwassee Watershed

The spillway gates on the Chickamauga Dam could regulate a normal spring "tide" on the Tennessee River, and if there was sufficient time to draw down the reservoir level its storage capacity could temporarily delay an average flood. But in 1940 anything approaching the size of the 1867 disaster would have wreaked havoc on the city of Chattanooga. Its citizens might get some sense of security as they watched the huge concrete piers rise out of the river, 7 miles upstream, but the TVA knew that their homes and their industries were still threatened and that the greatest potential danger lay in the valley of the

Hiwassee, which drained a 1000-square-mile watershed. No single dam on the main river could protect Chattanooga. The strategy in this case called for "defense in depth," and this meant a series of main river dams upstream as well as storage dams on all the tributaries draining that half of the Tennessee Valley basin which lay above Chattanooga.

The Hiwassee River rises in northern Georgia, on the northwest slopes of the Blue Ridge Mountains not far from Clay County. Of the five large tributaries of the Tennessee, this is the most southern one and is the little finger (see drawing page 9) that runs at right angles to the main river. The generally high altitude of the Hiwassee watershed causes exceptionally heavy precipitation, averaging as high as 60 inches of rain annually. For most of its course the Hiwassee is a typical



mountain river—rocky, winding, swift, and what the engineers call "flashy," due to its rapid rise and fall. As you know, the Chickamauga reservoir extends 20 miles up the Hiwassee; from there, moving up into the mountains, the river receives water from three tributary streams, the Nottely, the Ocoee, and the Valley. It is also fed by almost two dozen creeks, like the Candy, the South Mouse, the Hanging Dog, and the Tusquittee. It is this last one, of course, that joins the Peckerwood Branch, and from there one can follow the little brook that divides the Medford farm right up to its source at the spring in the rocky gorge.

Most of the watershed is heavily timbered and includes parts of the Cherokee and Nantahala National Forests. Even with this cover the runoff is heavy. The flow of water is even more variable than that on the main river, for this mountain torrent might drop to a mere trickle (100 c.f.s.) or come roaring down the narrow gorges at 50,000 c.f.s., as it did in 1920. With these conditions in mind, the engineers played very safe and specified that this dam should be able to discharge three times the 1920 record, or 150,000 cubic feet per second.

As was the case at Chickamauga, the same sequence of preliminary investigation and the careful consideration of all technical data came before any designs for the dam were drawn. The site of Fowler's Bend was chosen because it offered the greatest number of acre-feet without flooding the town of Murphy, North Carolina. The height of the dam was estimated at 307 feet, or roughly the height of a twenty-story office building. The normal pool level of the reservoir was set at an elevation of 1526 feet above sea level, and this figure came to have the same crucial interest for all upstream property owners as El. 683 had had on the main river behind Chickamauga Dam. Such a dam would back the water 22 miles up the winding river through the mountains toward Murphy. The TVA purchased almost 25,000 acres for this project, of

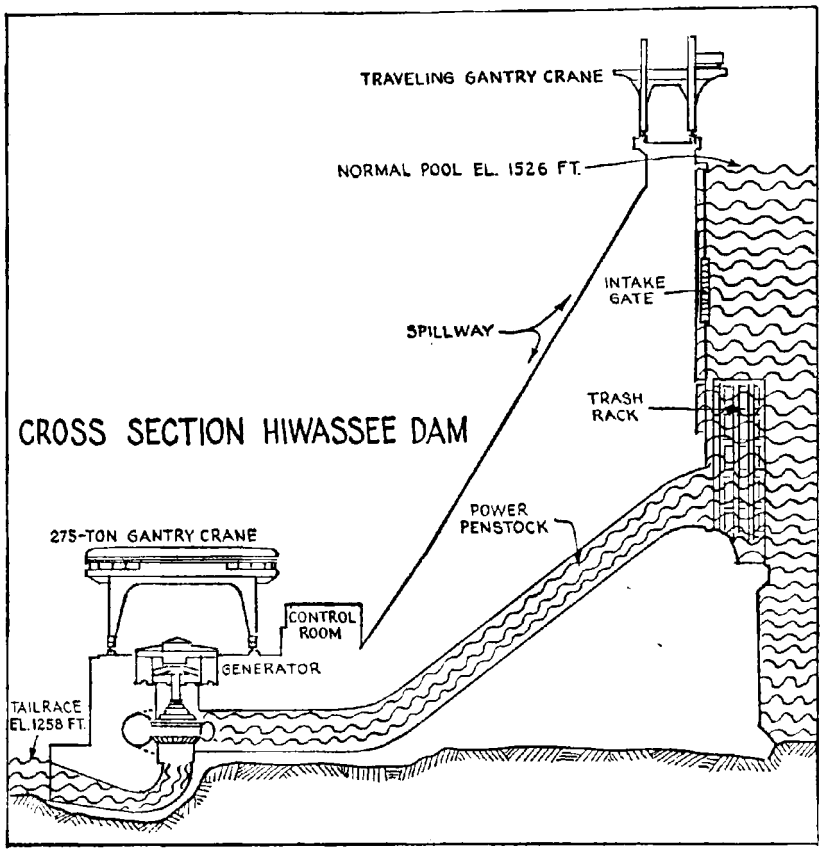
which only about one-fourth formed the actual reservoir; the rest was turned over as forest preserve to the U.S. Forest Service. Within Cherokee County 261 families had to be moved from their mountain farms. The steep and rugged hills were beautiful to look at, but they no longer offered even a bare subsistence to these farmers, who had come to depend on the local lumber industry for a living.

DESIGN FOR FLOOD CONTROL

Dams like the Norris and Hiwassee are referred to as "storage and power dams." Unlike the multipurpose dams on the main river, these have no locks, and only as they help to stabilize and regulate the flow of water between Knoxville and the Ohio can they be said to serve the purposes of navigation. But in terms of flood control they are like fortresses set at strategic points: they can block, delay, or break up the full force of the enemy's attack, which in this case is the excess runoff from the rain-soaked watersheds. These dams can also be considered as a series of giant valves all operated from a centralized control system, which will be explained later. By comparing the Hiwassee with the Chickamauga, one can see the great virtue of designing high dams for water storage. With only one-sixth the area of reservoir, the Hiwassee can store more than half the amount of water that can be held in the Chickamauga Lake. Such a dam is, in truth, one of the most important and efficient devices for regulating the flow of water all down the Valley.

DESIGN FOR POWER

The powerhouse is designed to accommodate two generating units with a total ultimate capacity of 115,000 kilowatts, which is somewhat more than the total capacity (four units) at the Chickamauga Dam. Again this is possible only because of the height of the dam. Though the seasonal water-storage schedule



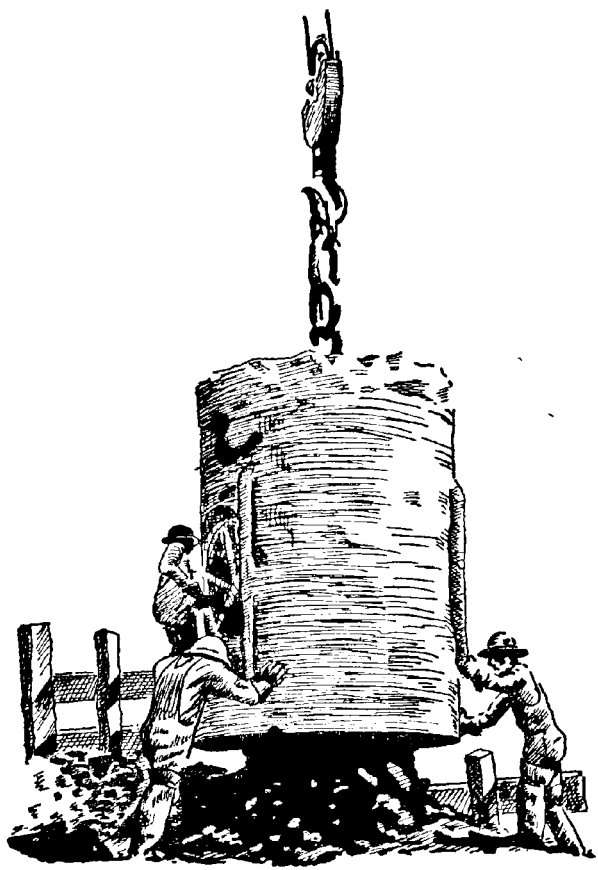
might cause the headwater level to rise and fall over 100 feet during a normal year, the operating head would still average about 190 feet above the tailrace. Each penstock, 18 feet in diameter, delivers 4200 c.f.s. to the turbines at this head. This amount of water, falling the 190 feet, turns the turbines at 120 revolutions per minute, which then produce the 80,000 horsepower needed to spin the main shaft and the generators. Under these conditions only 15 per cent of the theoretical horsepower is lost—in other words, the turbines can efficiently convert 85 per cent of the energy in the falling water.

CONSTRUCTION

It was estimated that the Hiwassee project would require 800,000 cubic yards of cement concrete. The cement had to be brought by rail to Turtletown and from there hauled by truck to the storage bins near the mixing plant, which was set up on the right bank a little downstream from the axis of the dam. The crushed stone and sand that formed the aggregate were quarried from a mountainside on the opposite bank. Today, in approaching any of the tributary dams, Fontana, Douglas, or Hiwassee, one will see on the downstream side the great scarred surface of the hillside quarry from which the native rock was blasted, crushed, screened, and washed before being mixed with the cement. Undertakings like these require not only the moving of mountains but pulverizing them, reshaping them, and finally setting them up again as vast ramparts of concrete held between the shoulders of the very hills from which they are made. This is made possible only by the skill and ease with which these enormous quantities of bulk material can now be handled. Bear in mind that almost half as many cubic yards of earth and rock had to be excavated from the site of the dam as the number of cubic yards of concrete poured into the wooden forms. Without the use of pneumatic drills, power shovels, huge dragline buckets, fleets of dump trucks, scrapers, and bulldozers, construction jobs like these would be impossible.

Perhaps the most remarkable of all the construction devices used was the cableway for handling and placing concrete. A cable strung between two towers, erected on opposite banks of the river, supported a trolley, or carriage, from which the cylindrical bucket containing the freshly mixed concrete was hung. It took 30 seconds to fill one of these 7½-cubic-yard buckets, which was then swung up and out, high over the

dam, lowered into the specified position, dumped in 5 seconds, and then quickly passed back to the loading stage. The complete cycle of cableway operation, when mass concrete was being poured, varied from 2 to 4 minutes per cycle, depending

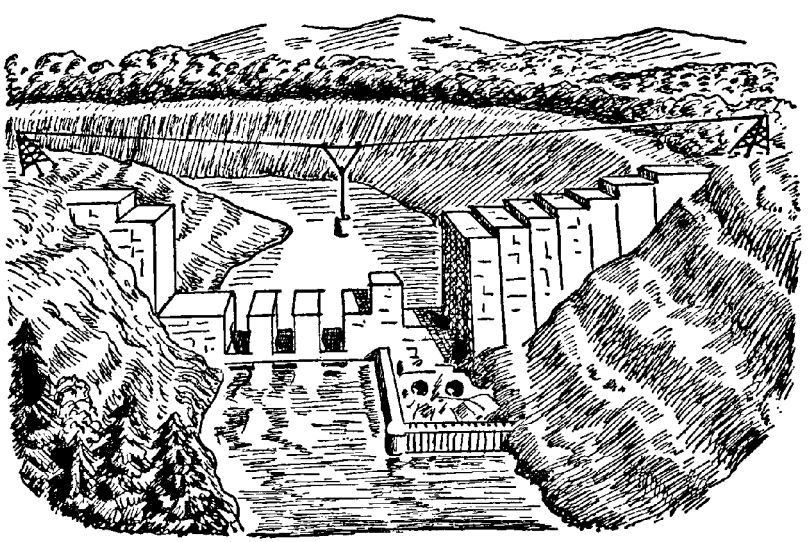


on the placing location. In this way about 150 cubic yards of concrete could be poured in 1 hour.

The coffer dams used on the Hiwassee project for diverting the river during construction were of a different type than the open steel silos used on the main river dams. There were two reasons for this: first, the rocky bed of the river, strewn with

boulders and cobbles, gave no footing for the silo-type coffer dam; second, the flash floods, which would raise the normal water level 17 to 23 feet in 24 hours and then subside almost as quickly, led the field engineers to build what are known as timber-crib coffer dams. These timber cribs are made by placing two heavily braced parallel board fences about 8 to 10 feet apart in the stream bed. The space between the two fences is then filled with rock and clay. There was no attempt to raise the timber cribs high enough to shut out floods, and two or three times during the course of construction these dams were overtopped by water, but, though slightly damaged, they were not washed away. Of course, work had to stop until the river dropped to normal so that the leaks could be sealed and the enclosed area pumped dry.

Coffer dam number one was built to unwater the south half of the river and enclosed the area to be occupied by the powerhouse and tailrace. Number two dam served the same purpose for the spillway and apron, and number three was moved back



across the river to protect the further construction of the powerhouse on the downstream side.

As you can see in this last drawing, the Hiwassee Dam was built in a series of vertical blocks. It took twenty-seven of these to span the gorge. The mass concrete that formed these blocks was poured into the forms in 5-foot layers, or "lifts." In order to form a monolithic structure the mass of the dam had to be free from major cracks, particularly cracks parallel to the axis of the dam. To obtain watertightness the concrete mix had to be plastic and workable, and it required expert skill to insure the bonding of each lift with the lift below. One of the major construction difficulties on such a project is the tendency of cement concrete to heat when poured in such enormous bulk. This was a problem in the building of Norris Dam, and the temperatures of the concrete on the internal portions of the dam remained above normal for five years. The use of low-heat cement and artificial cooling minimized this hazard on the Hiwassee Dam.

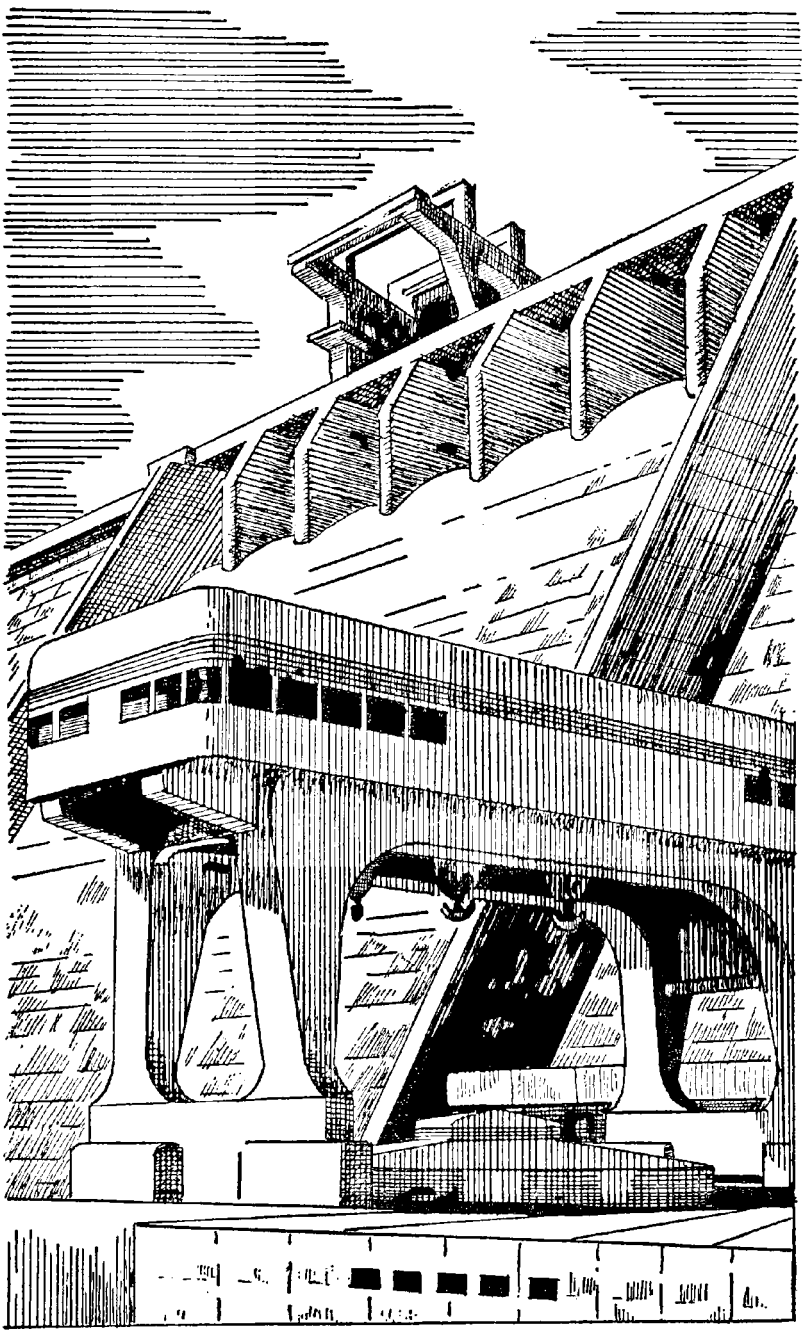
The construction of the powerhouse followed much the same pattern as at Chickamauga. The circular elbow-like forms of the draft tubes were first erected in the foundations of the powerhouse and then embedded in layers of reinforced concrete. Next, the steel plates that formed the steel lining of the scrollcase were riveted in place; one end of the scrollcase was joined to the giant 18-foot tube of the penstock, which slanted up to the intake gates on the face of the dam, while the other end tapered down as it wrapped around the circular opening in which the turbine runner would be placed. This runner, instead of having five propeller blades like the ones at Chickamauga, had nineteen blades set more in a pinwheel fashion—known as a Francis-type waterwheel. The generating unit at Hiwassee is outdoors, like the ones at Wheeler Dam, and is serviced by a rolling gantry crane very similar to the ones used on the bridge of the dam for operating the spillway gates.

The fact that this dam was built in a narrow canyon made it difficult to find adequate space for the switchyard. To get sufficient room to install this outdoor electrical apparatus, it was necessary to cut three huge steps in the rocky hillside next to the powerhouse. The transformers were placed at the same level as the generating station platform, while the circuit breakers were placed on the steps, and above them

rose the steel towers to hold the outgoing line equipment.

The relocation of the 261 families living within the reservoir site required all the wisdom and tact that the TVA could muster out of its former experience. As you know, half of the families at the Chickamauga project were employed in industries in Chattanooga, whereas these mountain people had spent their whole lives in the coves and valleys bordering the Hiwassee, and except for an occasional trip to Murphy had never been more than 10 miles from home. There were no real-estate dealers in these mountains, and if there had been the highland folk would not have trusted them. This required the expert help of many agencies, such as the WPA, the National Youth Administration, and the Civilian Conservation Corps. Listings of available farms were maintained by the North Carolina Agricultural Extension Service, and many local farm agents turned realtor and drove these mountain families with their six or seven towheaded children around the countryside, inspecting all possible new locations.

The gates of the four sluiceways through the base of the dam were closed in February 1940, and by May of that year the generating plant was in commercial operation. During these four and a half years the moisture-laden clouds from the Gulf and from the Atlantic moved across the Hiwassee watershed, turning the Big Wheel in rhythm with the change of seasons. But long before the dam was finished there were other clouds, dark and warlike, that rose from beyond the Atlantic to cast their shadows across the Tennessee River. Wars and the threats of wars were not new to the Valley, for only twenty years before the first dam across the main river, the Wilson Dam, was started under just such an emergency and as part of a defense program. As events moved swiftly forward in Europe, those in Washington responsible for the security of the country turned to the Tennessee Valley Authority with new and specific problems that required immediate attention.



Kilowatts to Bombers

The blitzkrieg in Poland made it perfectly clear to the planners in Washington that air power was basic to military preparedness. To expand the manufacture of aircraft required an enormous increase in the production of aluminum. This in turn could be accomplished only through a larger and steadier supply of electric power. It takes 4 to 6 pounds of bauxite to make 2 pounds of powdered alumina, and to reduce this to 1 pound of aluminum metal burns up 10 kilowatt hours of electricity. In 1856 aluminum was a laboratory product and cost 34 dollars a pound; by the First World War a pound sold for 34 cents, and from then on aluminum became an increasingly common and useful metal. Forty years ago the Aluminum Company of America, after looking around for a cheap source of electric power, decided that the Little Tennessee River offered an ideal site for a series of company-owned power dams that could supply sufficient electric power to operate a large reduction plant to be built at Maryville, Tennessee.

By 1940 these and other installations in the Tennessee Valley region had made it one of the principal aluminum producing centers of the nation. Normally aluminum manufacturers depend on what is known as secondary power for a large portion of their total output of metal. A generating plant like the Hiwassee produces wholesale electric power in three different categories: primary power—the power which is available to a consumer at all times, except for very temporary interruptions due to mechanical failures; secondary power—the power which may be interrupted at the discretion of the producer within certain limits, which are ordinarily provided in a contract with the purchaser; and dump power—the power in excess of all other classes of power, usually for short periods of time and only during exceptionally favorable conditions. In other words, during seasons when rivers were high and the

reservoirs overflowing, large quantities of aluminum were produced and stockpiled against the time when low stream flow made only primary power available. In this sense the reduction process of aluminum was seasonal. However, the new schedules of aircraft manufacture, under the national defense program, now demanded the full-time operation of all aluminum plants at peak capacity.

While Alcoa was building one of the most up-to-date and largest aluminum sheet-rolling mills at Maryville, the TVA was frantically working out its plans not only to increase the supply of electricity but also to stabilize that supply and overcome seasonal fluctuations. The Fontana project, at the foot of the Great Smokies, was already in the planning stage, and its 135,000-kilowatt capacity would ultimately fulfill the power requirements, but even under forced emergency conditions the construction schedule meant at least a three-year postponement.

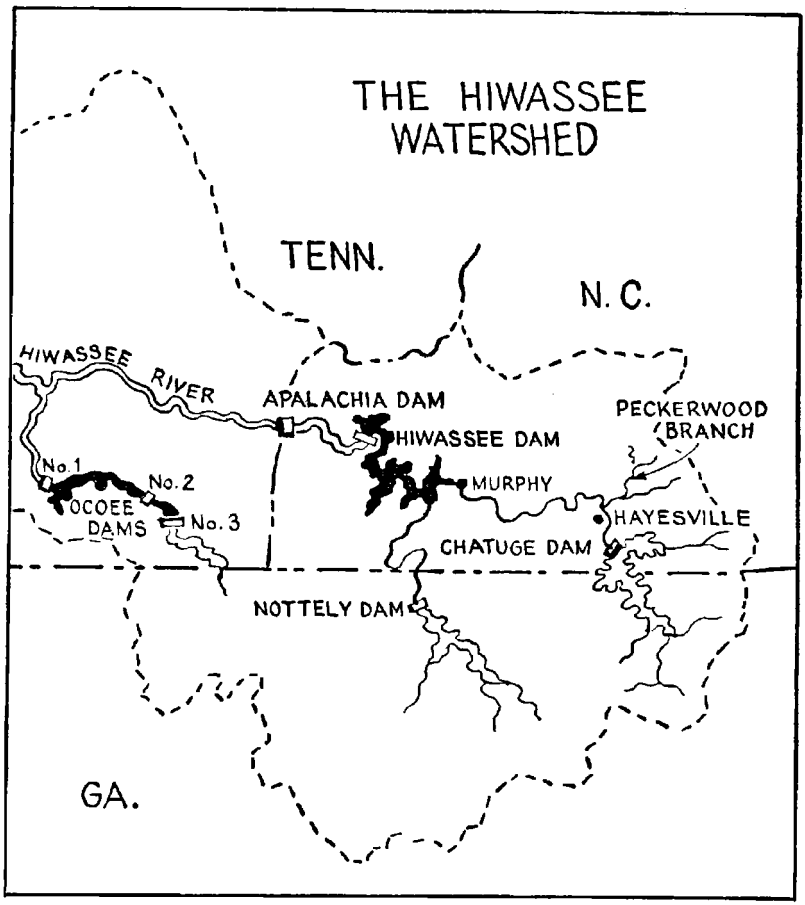
It now appeared that the whole power policy of TVA had to be re-examined. Although the tempo of construction during the last seven years had moved along at a fast and steady pace, in spite of the high *vs.* low dam interruption, it was now evident that not only the dam building must be stepped up but that the estimate of power consumption had to be entirely revised. Only five years before, in its 1936 report to Congress, the Authority recommended that the Hiwassee Dam be considered only as a flood-control project and that no generating units be installed. At the time there were two good reasons for the TVA's postponement of any increase in its electric-power program: first, the Authority, under the leadership of David Lilienthal, was in the midst of a legal battle concerning its right to manufacture and sell electric power; second, would the local demand for power ever justify the amount already planned? As yet there was no indication that the depression was over, and the 215,000 continuous kilowatts that would

soon be produced by the five main river dams, as well as Norris, seemed to warrant the TVA's cautious attitude on this, the most controversial of all its activities. With the same considerations in mind, even as late as 1939 only three of the four generating units were installed at Chickamauga and only one, out of the ultimate two, at Hiwassee.

As the TVA studied the various schemes for supplying more and steadier power during the war emergency, everything seemed to point to the further development of the Hiwassee watershed. As finally presented to Washington, the plan called for two smaller hydroelectric plants downstream from the Hiwassee Dam and two mountain storage reservoirs upstream.

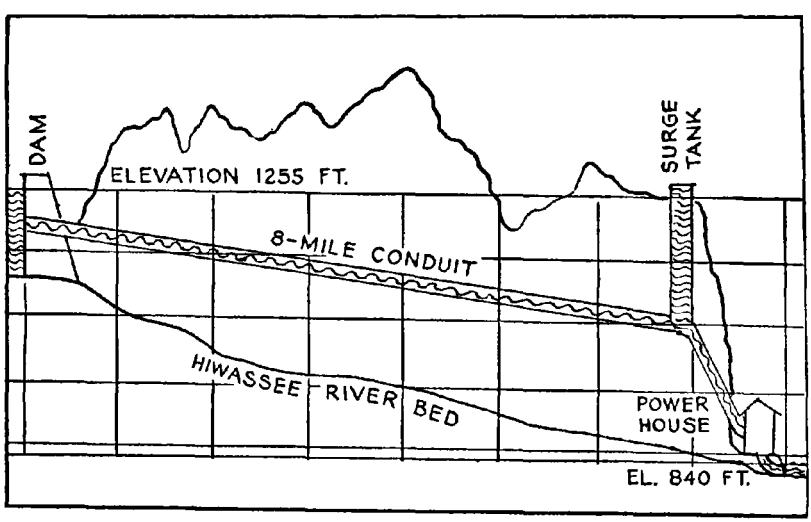
The Chatuge and the Nottely reservoirs would act as storage batteries, holding a reserve of "white power" up in the mountains at the headwaters of the Hiwassee River, while at Apalachia and Ocoee three projects would be built solely as power plants. Under such an arrangement the TVA expected to deliver 116,000 kilowatts of continuous power in eighteen months. As an emergency plan in the interests of national defense, it had been chosen as the quickest and most practical solution, but the Authority was careful to point out "that this was a minimum program and that additional loads may soon require further expansion of the TVA system." Washington's approval was not long in coming, and the work, under a rigid construction schedule, was immediately started at each of the four sites on the very same day that they were authorized by TVA Board of Directors.

For the purposes of this book the Chatuge reservoir has a special interest; not only is it a good example of the many storage lakes, set high in the mountains, that help control the flow of water near its source in the watershed, but this particular dam and lake brought many changes to Clay County and the Medford family. However, before going into the design and construction of Chatuge, there are certain features about



the Apalachia project that should be mentioned. In this case the engineers designed a dam and powerhouse that would produce the maximum electric power, and the usual provisions for navigation and flood control were secondary considerations. How was it possible to build a dam only half as high as the Hiwassee but to achieve an ultimate power capacity rated at only one-third less? As usual, the answer to this was the difference between the maximum operating heads—Hiwassee, 251 feet, and Apalachia, 440 feet. Still, how can you get a fall of water 440 feet out of a dam that is only 150 feet high?

Below the Apalachia Dam the Hiwassee River tumbles down its winding valley at an average drop of 26 feet per mile, and as the powerhouse is 12 miles downstream its elevation is 312 feet below the dam. The pipe or conduit that leads the water down to the powerhouse, instead of following the curving banks of the river, cuts in an almost straight line through the base of the intervening mountains. This conduit is 8 miles in length, and a large part of it is simply a tunnel 22 feet in diameter carved out of the solid mountain rock. The tunnel emerges on the face of a steep cliff more than 200 feet above the powerhouse, which stands below on the riverbank. Before reaching the end of the tunnel the water is held in an enormous surge tank, which equalizes the fluctuations in water level of the reservoir above the dam. From the bottom of this surge tank the flow of water is divided into two steel penstocks, which plunge down the face of the cliff to the scrollcases in the powerhouse below. These turbines are designed to run at the high speed of 225 revolutions per minute, or three times as fast as those at Chickamauga.



In spite of having to drill an 8-mile hole through those mountains and to build miles of access roads in order to bring equipment and personnel to this isolated district, the TVA engineers designed and built a power plant that added 75,000 kilowatts in less than the time allotted. Through expert planning, backed by experienced technicians and a well-seasoned crew of construction workers, the TVA switched the first generating unit on the line just two years and two months after authorization.

The Chatuge Reservoir

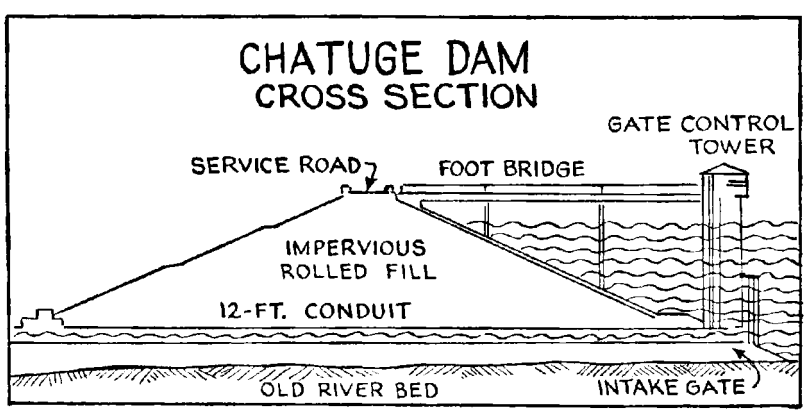
When Jim Medford and his Uncle Tom made their trip to Augusta in the wagon loaded with hams and dried apples, they took the dirt road leading from Hayesville to the village of Hiwassee, over the state line in Georgia. This old road bordered the Hiwassee River, which, there near its headwaters, became a gentle stream winding through a rolling valley flanked by the Tusquittee Mountains on the west and by the Blue Ridge on the east and north. As they jogged along the dusty road that morning Uncle Tom, using the whip as a pointer, called off the names of the owners and listed the virtues of each farm. There was the Andrews' place, with Hyatt's creek running between the house and the barns—always plenty of water for the stock. There was Jenkins' cornlot, yonder near the river, and if there wasn't a cloudburst in July it grew more bushels per acre than any in the county. The big white house belonged to the Penningtons—the best farm in the valley.

These bottom lands had always been the envy of the hill farmers. When the Chatuge Dam was later closed and the 13-mile long reservoir filled, some of the richest fields in the county lay many feet below the surface.

This reservoir and the Nottely project, 20 miles to the west, were built for the purpose of impounding the headwaters of

the Hiwassee in order to regulate and stabilize the flow of water into the reservoirs downstream. By holding the "white power" in these two mountain lakes the seasonal fluctuations would be reduced, and the engineers estimated that through these projects there would be an increase of 25,000 kilowatts of continuous power on the TVA's transmission lines. But, as always during that emergency period, there was the insistent question: How long would it take? If approved in July, could the dam be closed in time to catch the early spring rains the following February? Unless this were possible, it might be a full year before there was any "white power" to draw on.

To accomplish this the TVA had to carry out the hardest and tightest construction schedule it had ever undertaken. The design called for an earth dam 144 feet high and half a mile long. The spillway was to be a reinforced concrete chute 300 feet in width and 1300 feet long. The outlet control tower for regulating the discharge from the reservoir was located in front of the dam, in the deepest section of the old river bed. From the base of the tower a conduit, 12 feet in diameter, was to lead the water under the dam and into the original stream bed below the spillway. Such a dam required almost 2¼ million cubic yards of earth fill, as well as more than 100,000 yards of rock.



Work started the middle of July, and in three days' time the great earth-moving machines—pan scrapers, power shovels, turnapulls and bulldozers—came trundling onto the dam site. Even though some of the construction drawings were not yet complete, these giants began snorting and spitting up and down the embankment as they cut into the hillsides from which the earth fill was taken. All the usual operations, like building access roads, setting up the construction plant, and land purchase were telescoped to save time. Though surveys had been made earlier, maximum waterline levels had to be established. Little clearing in the reservoir site could be started until all the crops were harvested. Floodlights were installed, and work on the dam itself went on day and night, each of the three construction crews doing an eight-hour shift.

When this "storage battery" is completely charged, the operating pool level stands at an elevation figure of 1928 feet above sea level, which floods more than 7000 acres, half of them in Clay County and the rest in Georgia. All but a thousand of these acres were open crop and pastureland. As stated in the official engineers' report, the Hiwassee Valley was settled over a hundred years ago by people of Anglo-Saxon lineage who engaged in hunting, clearing the land, and growing food. Their descendants, who comprise most of the population today, have accepted this pattern of subsistence farming. The greatest resource of these people is their own resourcefulness.

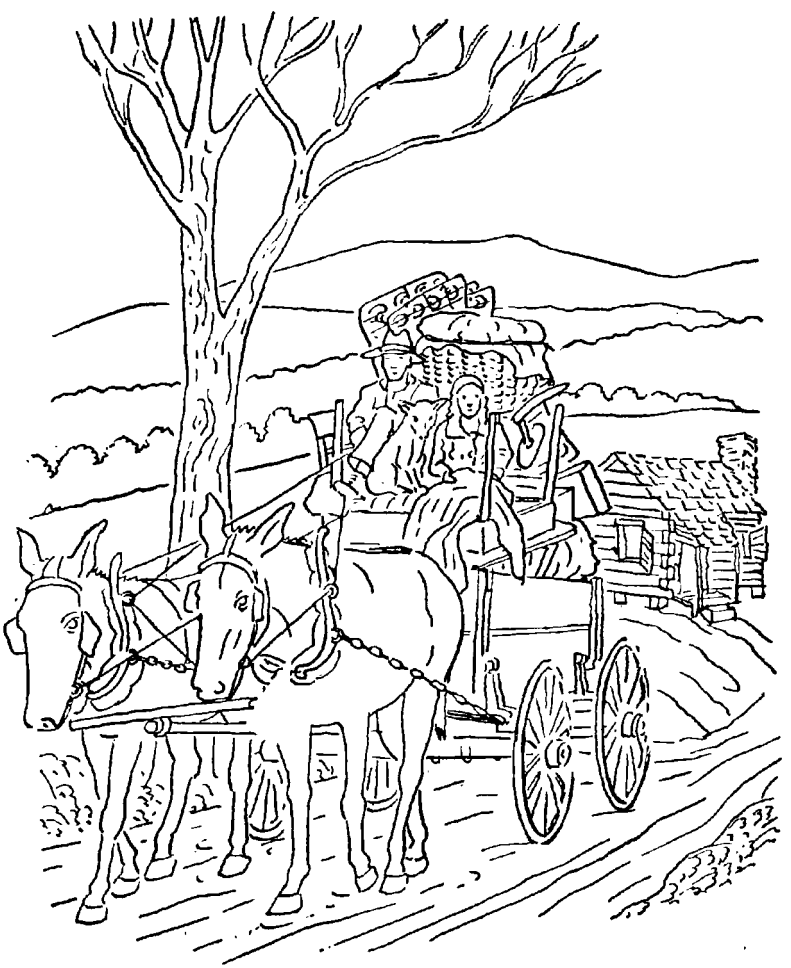
Among the 160 Clay County families living within the reservoir site was George Medford's youngest sister, Peggy Pennington. Her husband, Leroy Pennington, had died of typhoid fever seven years before, and she and her sister, Silvia Medford, lived in the old weather-beaten Pennington house with Squire Pennington, now an ancient gentleman past ninety. When the Chickamauga reservoir was being planned, the families that had to leave were given four years' notice, but under the emergency schedule at Chatuge there were only

five months in which to remove all houses, barns, livestock, and the year's harvest before the closure of the dam. Under the threat of war these were anxious times for everyone, and the impact of the draft and the desperate need for manpower in the war industries had already disrupted homes and family ties. After that fateful Sunday afternoon in December when the news of Pearl Harbor swept across the country, what had previously seemed to be a personal or private misfortune now was lost in the all-enveloping realities of war.

George Medford and his son Charley worked on the dam and later helped cut and burn the timber on the reservoir site. The control gates at Chatuge were closed February 12, 1942, less than seven months from the time the bulldozers began clearing away the overburden of earth from the spot where the dam would rise. With the completion of the Chatuge reservoir the last 200 square miles of the Hiwassee watershed could now be regulated. During the war years Chatuge fulfilled its purpose of stabilizing or "firming up" the available supply of electric power. Later, in 1946 and 1947, it played its part along with the other downstream reservoirs in storing the flood waters, which engineers estimated would have caused nearly 10 million dollars' worth of damage at Chattanooga.

As the construction program of the TVA moved forward, during and after the war, the other tributaries of the Tennessee River were dammed and controlled in much the same manner as the Hiwassee. At the same time, and from the very beginning, the TVA carried on its other closely related program, "reconstruction on the land." This part of the story also leads back to Clay County and the Chatuge reservoir. The building of the Chatuge was a turning point in the lives of many residents of the county, whether or not they were landowners within the reservoir area. Along with the others, the fortunes of the Medford family were also affected. So, before taking up the reconstruction that was carried out on the land, it might

be well to cover briefly the eight-year period between that May morning in 1933 when George's last trace chain broke, just as Congress passed an act establishing the Tennessee Valley Authority, and the fall of 1941 when George Medford and his son Charley worked on the Chatuge project.



X: Clay County Chronicle II

(*1933-1942*)

BOB MEDFORD, George's oldest son, was already taller than his father, and his slow, grave manner of speaking made him seem far older than his seventeen years. Charley, who was three years younger than Bob, should have been at school but had been excused to help with the corn planting. On that May morning when the trace chain broke, George had sent his two sons into Hayesville to swap some pullets for a bushel of seed corn. For some years now George had been harvesting less than twenty bushels of corn to the acre, and as a last try to increase the yield he had decided to buy some new seed. The boys did not get back until almost noon, and their father, after hanging the sack of shelled corn on a peg in the barn, asked if they had had any trouble making the swap.

"No, Paw. The man at the feed store's got more seed than he can sell," said Bob. Then he continued slowly, "What took us so long was my fillin' out all those guvment papers."

"So you didn't pay no heed to your Paw's idees? Goin' on guvment charity, eh?" cried George, glaring at his oldest son. He thrust his hands deep in his overall pockets and started up the path to the cabins. Halfway up he stopped and waited for Bob. "Maybe you're right, son," he said gently as they trudged on together. "I can't offer you nothin' here, and you're big enough now to do as you will. What kinda work you goin' to do on this WPA, or whatever you call it?"

"I'm goin' to be workin' on the road, 'tween here and Hayesville. They figure to take out some of the worst curves and build a new bridge across the branch," replied Bob. "Both the Hankinson boys have already started work, and all the men over at Lasher's were signing up this morning. Honest, Paw,

there ain't nothin' wrong with the WPA. We're agoin' to work for that money."

"Well, you go ahead, Bob. It's better'n scratchin' round on this old farm. But I ain't takin' orders from no one, and I ain't takin' no guvment charity—be it Democrat or Republican. Charley and me'll get that corn in someway."

George Medford did manage to get his last lot planted, and as one season followed another he went about his work on the farm, following the old routines of clearing and burning, planting and harvesting, he had learned from his father. He remained secure in the belief that unless these duties were performed as they always had been, the farm would go to pieces and the family would starve. It would have been impossible to persuade him that, if it had not been for Bob's weekly check and the help given them by his sister Peggy Pennington, the taxes never would have been paid and his wife never could have managed to serve the three scant meals a day.

It was that summer that Leroy Pennington died of typhoid fever. The Medford family came in their threadbare Sunday best and sat stiffly in the gloom of the shuttered front parlor, gazing in wonder at the old rosewood furniture while the Baptist minister mumbled through the service. Peggy Pennington was determined to keep the farm going, and so, a week after the funeral, she persuaded her sister Silvia to come over and help her look after the children and old Squire Pennington. The squire, well into his eighties and delicate in health, became more and more cantankerous and opinionated each day.

1935-1938

On a cold, raw January afternoon the local farm agent drove out from Hayesville to the Tusquittee Mountains and, seated in front of George Medford's fireplace, tried to explain to him the benefits to farmers if they signed up under the new Agricultural Adjustment Act (AAA).

"We've had this plan in operation more than a year now, and you're the only one in this section of the county that hasn't signed up. I'm not tryin' to force you into it, but I felt it was my job to come out and explain it anyway," said the local agent with a smile.

George just could not seem to understand the reasons for the government payments, and after another hour of questions and answers he cried out in exasperation, "Mister, you mean to tell me the guvment's gonna pay me twenty dollars an acre for *not* planting corn?"

"Well, Mr. Medford, that's about what it comes down to if you follow out all the other requirements. Also, you'll get an allowance of five dollars' worth of lime for every acre of pasture that you put in."

"That sounds fair enough, only you can't grow grass nor clover on this farm—lime or no lime. My Paw and I tried it a spell ago when we were sellin' cream. I tell you, it just won't catch. Even my grandfather give it up, and he was a good farmer and times were better round here then. Now if you want me to raise only two hogs next year, what's the use of any pasture?" George rose and stood with his back to the old clay-chinked fireplace. "You're dead right about our not being able to sell what we do raise, and if the guvment's got a scheme for makin' things better I don't want to stand in the way. I'll go along with your AAA."

"Okay, we'll try it for a year, eh? Also, I'll arrange about young Charley's going to the CCC camp over in Murphy. All the boys seem to like it, if they don't mind a little outdoor work," said the local agent as he shook hands before leaving.

The Civilian Conservation Corps, along with the TVA, had started an intensive tree-planting experiment. Gangs of boys with mattocks and shovels moved across the county, planting the steep, eroded hillsides, the gullies and scalds, with three types of seedlings: short-leaf yellow pine, loblolly pine, and

black locust. Charley liked the excitement of being away from home, and in a few months' time, despite his age, he was put in charge of a dozen other young tree-planters. Later that summer, while they were working near the Peckerwood Branch, Charley proudly brought one of the TVA foresters over to talk with his father about setting out some seedlings on the barren western slope.

"I see you got some volunteer loblolly already started up there," said the forester, gazing up at the hillside. "I'd suggest filling in with short-leaf yellow pine, and we'll plant the black locusts in the scalds. Tell me, Mr. Medford, how does that brook behave when you get a heavy rain up here?"

"Well, sir, just as you were sayin' about the land washin' away, it gets all riled up with mud," George answered and pointed down below the barn. "You see that second lot down there? Many's the spring I've seen that covered with more'n a foot of water." George turned back and looked up at the slope again. "You say you're planting some of Hankinson's old fields? I reckon it's a good thing. Certainly ain't worth nothin' the way they stand now. If you wanta plant it, go ahead, seein' I'm not responsible for it, and as long as I'm on the place I'll make sure that no one chops it down nor burns it off. But it seems like a mighty queer experiment to me. All that fuss and bother just 'cause that li'l brook gets riley after a shower."

As is usual on a farm, after endless quiet days everything seems to happen at once. The truck loaded with four tons of lime arrived the very same morning that the CCC boys began planting the western slope. George hastily had to clean a space on the barn floor to set the sacks of ground limestone, and while he was busy with this one of the tree-planters came breathlessly down the hill to tell him he was needed up on the slope. No one, including Charley, knew where the boundary line was, and if he didn't hurry they would plant the whole

Tusquittee range in short-leaf yellow pine. By the end of the day George was worn out. After supper he sat on the porch with Bob and cussed the government for meddling in his affairs.

"But, Paw, it's for your own good," said Bob gravely.

"Maybe so, maybe not. I'm old enough, and ugly enough, to decide that for myself. Me and the guvment can't run this farm together. It's one or t'other, and from now on it's me."

Though George had really intended to spread the lime out on his last year's cornlot and try some clover seed, he never got around to it. He did manage to haul it from the barn to a corner of the field, and as the paper bags melted in the rain it lay there—a gray-white pile, silent monument to the good intentions of the AAA. In three years' time one could see the long green leaders of the yellow pine seedlings showing above the broom grass, but the black locusts never rooted and the red clay gullies still turned the little brook a tawny brown in wet seasons.

1939-1942

For some time now everyone in Clay County had been accustomed to seeing the TVA's shiny station wagon with its U.S. license plates parked here and there by the side of the road. The surveying crew of four or five men was usually working somewhere in the neighborhood. No one paid any attention to the neat little stakes with the undecipherable markings, driven in at random, sometimes along the road, sometimes dotting a line across an old abandoned field. At first there were rumors that a great state highway was going to be built; then it was going to be a copper mine, like the one at Ducktown; and then, later, there were grave warnings that another dam was to be built, bigger than the one at Fowler's Bend, which would flood every inch of the county to a depth of two hundred feet. But nothing happened, and the men in

clean, faded overalls, their wide black hats pushed up on their foreheads, sat in the sunshine on the courthouse steps and speculated on the events taking place in Europe and how long it would be before everyone was in the war.

Early in the spring of 1941 the local farm agent held meetings in Hayesville to explain the emergency and to announce that all crop restrictions were off and that it was the duty of every farmer to raise as much as he could during the coming season. Fortunately Charley returned from the CCC camp just two weeks before Bob was drafted. He and his father made plans to plant an additional ten acres, but by May, because of the old broken equipment and the fact that one of the mules went lame, they were able to get in only five extra acres of corn. As it turned out, they were just as well off, for there was barely time to harvest what they had planted.

As Peggy Pennington drove into the barnyard that hot July night and came running breathlessly up the path to the cabin, George, who was sitting in the dusk, knew something serious had happened.

"What's wrong, Peg? Has the old squire died?" called George, as he rose to meet her.

"Oh, George, when he hears what's happened, I don't think he'll be able to stand it. The government is taking over all the farms in the Hiwassee Valley," said Peggy, sitting down on the stoop.

"So—now they're agoin' to show us how to farm, eh? By thunder, if they so much as set foot on—" cried George.

"Hush, George. They're not going to farm. They're going to build a reservoir, a lake. They plan to flood most of the valley, right into Georgia. The engineer told me that the water would be higher than the second-story windows."

"Durned fools," snorted George. "Best land in the county. And then that farm agent tellin' me that the guvment needed

every bushel of corn we could raise. Mighty glad when the draft caught him. One less meddlin' in our affairs."

"But, George, you don't seem to understand. On account of the war emergency they've got to build that reservoir right off. We must be out by Christmas time. We're to be allowed to harvest the crops we got in, and we can move any barns and buildings off the land, but I don't see how I can do it in five months. I'm scared to tell Grandpa Pennington. It'll probably do him in."

"Tell me, Peggy," said George quietly, "what's the guvment goin' to pay you for the farm?"

"They're surveying it this week, and we'll get the top price per acre for it. That part's all right. But where in the world will we move to? That's been my home now for twelve years, and I hate to leave it." By now it was black dark and George could barely see his sister on the stoop, but he knew that she was crying.

"Listen, Peg, maybe it's time you moved back here in these mountains, where you come from. Besides, I'd kinda like to have you a little nearer the family. The war's acomin', I'm sure of it, and this is part of it. Probably see some hard times before it's over. I was just sittin' here and thinkin' about Bob when you come up the path." George stood up and turned toward the cabin door. "I'm goin' to get Charley to drive you home now, and I'll be over in the truck in the morning. Let me tell the old squire about it then."

Charles Pennington took the news so calmly that George and Peggy decided that he had not understood what was happening. When George had finished explaining about the war emergency and the new reservoir, the old gentleman grasped the cane that lay across his knees and mumbled, more to himself than to them, "So the scalawags and carpetbaggers are acomin' back!"

On the way home that day George stopped at the TVA

field office to find out when the survey would be complete. He was told that it would be finished by the end of the week. As he was about to leave, the engineer asked him how busy he was on his own farm.

"Well, to be honest, we haven't done much farmin' for quite a spell. Me and the boy finished cultivatin' the corn last week."

"Mr. Medford, we need every man we can hire to get this job done on schedule. Why don't you step over to the employment office, just over there. They'll give you all the information. Anyway, drop in Friday or Saturday. I'll have the figures on the Pennington acreage."

George stopped in at the employment office and found that if he and Charley both went to work on the dam, together they would earn nearly a hundred dollars a week, which would include twenty hours' overtime. The ten hours a day, six days a week, did not bother George, but the idea of working along with a gang of other men and taking orders—that was something else. Charley could hire out if he wanted to, but he, George Medford, would stay on his own place and not get mixed up in any "guvment handouts." Besides, the Medfords didn't need any hundred dollars a week. The taxes were paid and the few bills at Hayesville could run along till after harvest. Why, that was more cash than he had seen in years—a couple of months' work and he could buy a new truck, maybe even a tractor.

All the way home George argued it back and forth. As he drove into the barnyard he saw Charley filling two buckets at the brook. George angrily slammed the truck door and, without thinking what he was about to say, called to his son, "Well, Charley, we're in for it. You and me's got to help out on the Chatuge Dam. Guvment needs every man in the county. They've got a bad situation over there, and we're startin' the first of the week."

The next five months were the busiest the Medfords had

ever known. George hated to lose even a week's work on the dam as it came time for him to harvest his corn. When he went back to work he was put in charge of a crew of local men who cut down and burned the old woodlots that stood within the reservoir area. This was work he knew well, and he took pride in seeing that the stumps were cut low and clean and that the brush was piled so that it would burn quickly. By that time Charley was an expert with a bulldozer, particularly in rooting out stumps and leveling off the exposed banks of what would become the shoreline.

The slow and even rhythm of the Medfords' life had changed. Whether it was the impending sense of war, or the well-timed rush and bustle of modern construction, George and his son, like many of their friends and neighbors, were caught up and swept along in the urgent need for speed and production.

Even with the sixty hours spent at the dam, there was still time to help the Penningtons move to the Jackson place. Up until his death ten years before, old Elmer Jackson, who had taught Leland Medford penmanship with a goosequill pen, had owned and run a farm just across the road from the Hankinsons, near the Peckerwood Branch. His widow had moved to Hayesville, and the place had been rented to tenants for some time, but in the last two years it had been vacant. The old clapboard house was boarded up, and the fields were sprouting in brush. It was always known as a good farm and easy to work, with at least forty acres of level ground along the south side of the branch. Peggy Pennington signed the deeds the week before Pearl Harbor, and from then on George and Charley spent every Sunday getting the house and barns in shape. It was the barn roofs that caused some of the delay in moving, for until they were weathertight the tons of hay and feed could not be trucked over from the Pennington place.

By Christmas the dam was nearly complete, all but the wide

concrete spillway. There were still thirty families living in the barren desolation of the reservoir site. By now the old roads had nearly disappeared, the bottom lands were a bare expanse of stumps, with here and there, on a rise of ground, the square gaping hole of a building's foundation, the flagstones still marking the path to the spot where the mailbox had stood beside the road. In the midst of this wasteland, the old squire lay in the bed he had slept in for nearly ninety years, a desperately sick man. Surrounded by his own familiar objects, in the room he had always known, he seemed totally unaware of what was taking place around him. The TVA engineers had purposely kept the road open so that the doctor could make his daily visit. By the middle of January the last of the stock and equipment were loaded on trucks and moved to the farm on the Peckerwood Branch.

After consultation with the doctor and Peggy Pennington, the TVA officials agreed to postpone the closure of the dam for twenty days, in the hope that the old gentleman might end his days peacefully in his own home, unaware that within a year those familiar fields would lie twenty feet under water. Early on the morning of February 11 the squire lapsed into a coma, and on the doctor's orders he was moved by ambulance to the hospital in Murphy, where he lingered on for another week. Late that same afternoon in the misty winter dusk, George Medford and his sister picked up the few last pieces of furniture and personal belongings and drove back into the Tusquittee Mountains. They were the last of the families to leave the reservoir, for at noon the next day the gates under the control tower in front of the dam were closed.

XI: Reconstruction on the Land

Soil

AS THE United States entered the Second World War, there still remained more than ten thousand square miles of uncontrolled watershed in the high eastern part of the Tennessee Valley. Despite Norris Dam and the recently completed dams along the Hiwassee, the surplus runoff from that uncontrolled mountainous region held the threat of floods that could damage or destroy the installations and war plants downstream. The need for flood control and a navigable inland waterway still remained, but the urgent demand for electric power during the war years threw the whole construction program into high gear, and one great dam after another rose, not only on the main river, but on all its tributaries. And so, within the next ten years, the Big Wheel was brought into balance; every ton of falling water served some useful purpose. While this gigantic water-control system was being built, the TVA did not neglect the Little Wheel. The program of reconstruction on the land also started in 1933 and moved forward with the same bold determination and careful planning.

HOW TO KEEP THE LITTLE WHEEL TURNING

Think how many city dwellers there are who hope and dream of returning to the country! After the cramped quarters and the mean streets, life in rural communities holds the promise of peace and plenty. However, the reality is often different.

It was true that the people of the Valley lived in a beautiful countryside; also, they were blessed with a mild climate and a

plentiful rainfall, but from there on the dream fell apart, for the great majority were forced to accept a miserable standard of living from which there was no escape. As the resources of land and forest disappeared, the hope and strength of those living in the Valley also failed. It did not require a master mind to see what had to be done; it was simple and obvious. First, if the fertility of the soil could be renewed, then that abundance of sunshine and water could be put to work and agriculture might again become profitable. Second, if the forests that were left could be protected and extended, then one of the basic resources of that region might be saved. Third, if electric power could be made available in rural districts, the drudgery and isolation of farm life would be reduced; and, last of all, if the local communities could carry out their responsibilities regarding health and education, then the initiative and vitality of the Valley people might carry them forward to a higher standard of living.

None of these objectives was new; everyone had agreed on them for some time. But the obstacles that stood in the way were equally old and equally real and had blocked the way so long that many considered them inevitable. How could you ask a farmer, who rarely saw more than a hundred dollars a year in cash, to finance himself while he converted his farm from the row crops of cotton, corn, and tobacco to pastureland and animal husbandry? How could he afford the lime, fertilizer, and seed? Most important of all, would he know the successive steps in such a conversion? Would George Medford understand the rotation of crops and contour plowing? Did he have the technical knowledge to carry out such an experiment?

These were some of the realities, and it was evident that the task required more than idealism, more than good intentions, more than just money. The WPA and other agencies

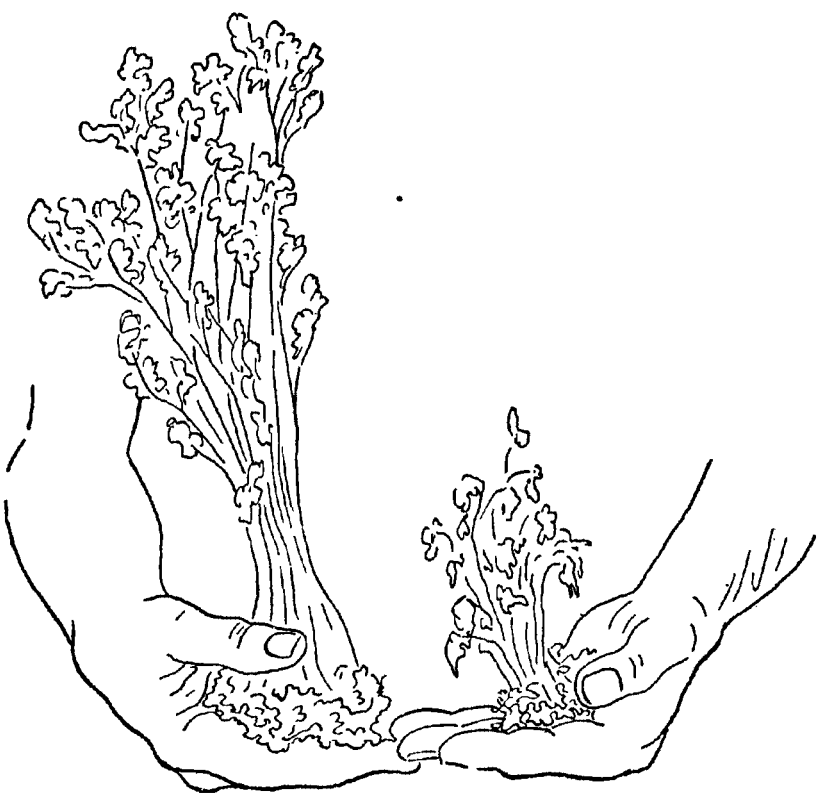
may have kept the Valley people from actual starvation, but the fundamental situation remained unchanged. The Tennessee Valley Authority was fully aware that any attempt at reconstruction on the land required not only creative imagination and understanding on the part of those directing the program, but, to be effective, the program must include the active participation and democratic planning of those for whom it was designed.

Each of the seven states within the Valley had long before established their agricultural or land-grant colleges, and for some time now their Experiment Stations and Extension Services had done what they could in giving technical help to the Valley farmers. The Authority wisely chose to work through and with these agencies rather than to set up a rival service of its own. Also, through the Extension Services the Authority enlisted the help of all existing community organizations, as well as farmers' cooperatives and associations. This was primarily a job of education—adult education—and the TVA's basic policy was to teach by example and not by command. The local farmers themselves were to test and demonstrate the value of the new agricultural methods. The success or failure of these test demonstrations were right there where any passer-by could see them for himself. A brilliant green pasture in the otherwise gray-brown winter landscape of the Valley was visible proof that something new had been added to the agricultural picture.

"ANIMAL, VEGETABLE, OR MINERAL?"

By 1933 it was no longer a guessing game, for the science of soil chemistry had already proved that successful agriculture was based on all three, in the following order: fertile soils required the presence of certain basic minerals that strengthened and nourished plant growth, and these vigorous plants in turn nourished and strengthened the animals that fed upon

them. Grazing animals have always known this. Why will they risk their life for a lick of salt? Why will they travel miles or break down fences in order to reach a special patch of grass that looks to an untrained eye no greener than any other? Why, for instance, within one region, did the deer and bison make game trails that all lead to the Kentucky blue-grass country, and why, two hundred years later, was that same pasturage still recognized as one of the best breeding places for race horses? The answer to all these questions is generally the same —that is, the grass in those particular regions grows on soil



that contains a high proportion of lime, phosphate, and other minerals.

Soil chemists now refer to these essential minerals as "the critical 5 per cent." "Air and water provide 95 per cent of the elements nature uses to make the food we eat, both vegetable and animal. The remaining 5 per cent is composed of calcium, phosphorus, potassium, and the other essential soil minerals. The bodies of animals and human beings are composed of the same elements in a somewhat similar balance. In the natural cycle of growth, decay, and rebirth these two groups of exhaustible (soil minerals) and inexhaustible (air and water) elements are forever being used and reused. The great catalyst of this system—nature's bridge between the organic and inorganic worlds—is the chlorophyll of the green leaf." [1]

Phosphorus is found in every living cell, and of all the minerals that make up the critical 5 per cent, phosphate is one of the keys that can unlock the vitality of the soil. Phosphate (or calcium phosphate, in its natural state) is a kind of soft rock formed by the bones and shells deposited by living creatures in the primordial ooze millions of years ago. As the ancient seas retreated into what are now the oceans of our planet, these remains lay scattered on the dry land. Some deposits stayed near the surface, as in the "blue-grass" region, while others were buried under succeeding layers of geologic formations, and so, today, we can find no uniform order in the distribution of available phosphate. Even in their virgin state the soils of the Valley were probably deficient in this all-important mineral. When the naked earth was exposed to the annual fifty inches of rainfall what little mineral deposits existed were washed away or finally exhausted in the making of continuous crops of corn, cotton, and tobacco.

In less than a hundred years the Medford farm had been completely mined of those minerals that formed the critical 5

[1] *Food at the Grass Roots* (Washington, D.C.: Department of Agriculture).

per cent. There was no need to make a soil test of George Medford's sloping acres; any physiologist could have recognized the signs of malnutrition in the human beings and animals that lived there. But the problem was more than one of merely replacing these vitalizing elements. To repeat the long, sad story of the cotton planters of the South, who dumped tons and tons of commercial fertilizers on their worn-out fields as they skimmed them off for the second or third time, only to find that they had "fed the crop and not the soil"—this was in no way the answer. Here again the Little Wheel was out of balance, and as the winter rains washed the soil away from the roots of last year's corn crop, the Big Wheel became a destructive force ravaging the surface of land, tearing it apart. How could the sunshine and water be changed to a profitable asset?

SUPERPHOSPHATE FROM MUSCLE SHOALS

Harcourt Morgan gave up his position as president of the University of Tennessee to direct the TVA's program of reconstruction on the land. He was a man with the vision and zeal of a crusader, but above all he had a practical plan for replenishing the lost fertility of the Valley. He understood the new developments in soil chemistry, and as a student of local agricultural methods he had a first-hand knowledge of just how the Valley farmers used, or more often misused, the land they tried to cultivate. No matter how poor the harvest, these hardy people had no thought of abandoning their hillside farms, and they looked with tough skepticism on any attempt to change their routine. Dr. Morgan recognized this and also understood that these farmers were trapped in a descending spiral, caused by worn-out fields, worn-out pocketbooks, and worn-out lives, all of which made them cling the more fiercely to the old traditional methods of farming handed down from father to son.

Over a period of years he had proved to his own satisfaction that grass and clover could be made to grow on these exhausted fields with the help of lime (ground limestone) and concentrated phosphate. Through the correct use of these fertilizers a strong sod could be established in one growing season, and by the time the winter rains had come the minerals would be held in the tangle of grass roots. Dr. Morgan had also found that in most parts of the Valley this sod would form a green pasture on which the stock could graze the year round. Once the sloping fields were covered with such a pasture, the raising of dairy herds and beef cattle could become a practical and profitable part of Valley farming. In time the old cash crops of cotton, corn, and tobacco might be reduced, and the new practices of crop rotation, strip planting, and contour plowing be introduced. This in its simplest elements was Dr. Morgan's plan. The tool he would use to accomplish this would be a highly concentrated phosphate fertilizer; the proof of its value would depend on the success or failure of the test demonstration farms throughout the Valley.

Cotton, the king of cash crops, had levied a royal tax in the form of commercial fertilizer on the Southern planters. As the mineral deficiency in the soil began to cut the yields in other parts of the country too, the use of commercial fertilizer boomed. Fertilizer may or may not have stimulated the crop, but it definitely did not replace the lost critical 5 per cent. For one thing, up until the 1920s every hundred-pound bag of fertilizer contained nearly twenty pounds of "filler" (mostly sand), which the farmer carefully spread out upon his land in all innocence. Before the TVA took over Muscle Shoals, the Department of Agriculture had already been experimenting with the production of a better grade of fertilizer. Electric furnaces set up in the old nitrate plant number two were at work, making a more highly concentrated form of phosphate. This triple superphosphate, as it was called, was almost three

times as strong and therefore went much further than the ordinary commercial product.

By 1935 the TVA had started research on the production of calcium metaphosphate. This experiment was partly interrupted during the war, but today Muscle Shoals is turning out one of the cheapest (when delivered to the farmer), as well as one of the most concentrated, phosphate fertilizers available to agriculture. The possibility of this chemical research and the ultimate production of metaphosphate has in large measure been accomplished through the plentiful supply of cheap electric power from Wilson Dam. Here is an outstanding example of how the construction program on the river tied in directly with the reconstruction on the land. The controlled power of the Tennessee River heated the electric furnaces that fused the rock phosphate into a substance that in turn helped to revitalize the soil of that same valley through which the river flowed.

EDUCATION BY EXAMPLE

Pulverized or ground limestone was locally available throughout the Valley, thanks to a general outcrop of limestone rock. Harcourt Morgan's tools, in the form of lime and phosphate, were at hand; the next step was to demonstrate what they could do. For the government to have bought an acre here and an acre there and turned it into green pasture would have meant nothing. The skepticism of the local farmers would have remained unshaken; and they would always have the same question: "Sure that's a mighty pretty stand of clover, but where am I going to get the money for seed and fertilizer?" And they were right, for this was something that they had to prove to themselves. Given the tools and the guidance, they had to work it out their own way. Just to have supplied them with lime, phosphate, and a book of instructions would not have accomplished anything. The AAA gave George Medford

a few tons of lime, but that lime never helped to grow a blade of grass. To convert a run-out farm that could hardly support one cow into a going dairy business required not only patience, hard work, and resourcefulness on the part of the farmer, but also a carefully planned schedule with each succeeding step carried out under expert guidance.

With the help of the TVA this expert guidance was to come from the local farm agents, who were representatives of the Agricultural Extension Services. It was through these farm agents that the neighboring farmers were called to meetings in the rural schools, town halls, and churches. These gatherings were usually held at the beginning of the year, and those who attended came by wagon or farm truck over the frozen dirt roads from the outlying farms. After warming themselves at the sheet-iron stoves, the whole test-demonstration program would be outlined and discussed. Motion pictures were shown, and large charts were hung on the wall to explain just what part the government would play in this scheme and what the added responsibilities would be on the part of the test-demonstration farmer.

The government agreed to supply 90 per cent of the phosphate required per acre for each new field turned into pasture. The local farm agent stood ready to give expert advice as needed.

The test-demonstration farmer had to supply his own lime and seed (usually a mixture of orchard grass and ladino clover). He agreed to carry out the new soil-conserving practices as outlined by the farm agent and to keep careful records of fertilizer used and harvests gathered.

Generally speaking, there were always one or two farmers at these community meetings who volunteered to convert their farms into test-demonstration units. Before being signed up, all those present had to agree that these were typical farms of the region and would be a fair test of the program. In time,

whole communities became test-demonstration areas, and later, following the war, certain counties, like Clay County, which lay within a single watershed, were brought into the program. By 1947 there were some thirty thousand test-demonstration farms in the Valley. That was not a great many, and not all were successful, but those that were could be recognized easily; their fields were green the year round and their healthy stock grazed on the permanent pasture. They were the visible example of what could be done, and as the neighbors drove by they could not help but remember that only a few years ago these were gullied slopes barely able to support the broom grass that covered them.

The establishment of a permanent pasture was only a start, only the first rung in the test-demonstration ladder. There are five steps to that ladder on which fifty-eight thousand demonstrators, along with their neighbors in greater or less degree, have been climbing during the past decade:

1. *Soil, water, and crop management (physical, chemical, botanical)*: Lime, phosphate, and other essential minerals are applied. The maximum use of soil and water is obtained by rearrangement of fields and crops to fit varying conditions of soil, slope, etc. Acreages of leguminous hay, pasture, and cover crops are increased. Row crops are decreased in acreage and grown on land best suited to such crops. Improved varieties and types of crops are substituted for low-yielding, low-value crops. Where necessary, slopes are terraced and strip-cropped, and bottom lands are drained.

2. *Livestock management (biological)*: Based on larger and more nutritious feed supply, together with improved management practices, production of livestock and livestock products is increased both in quantity and quality. The livestock system is brought into proper balance with the adjusted cropping system, the labor supply, and the market demand.

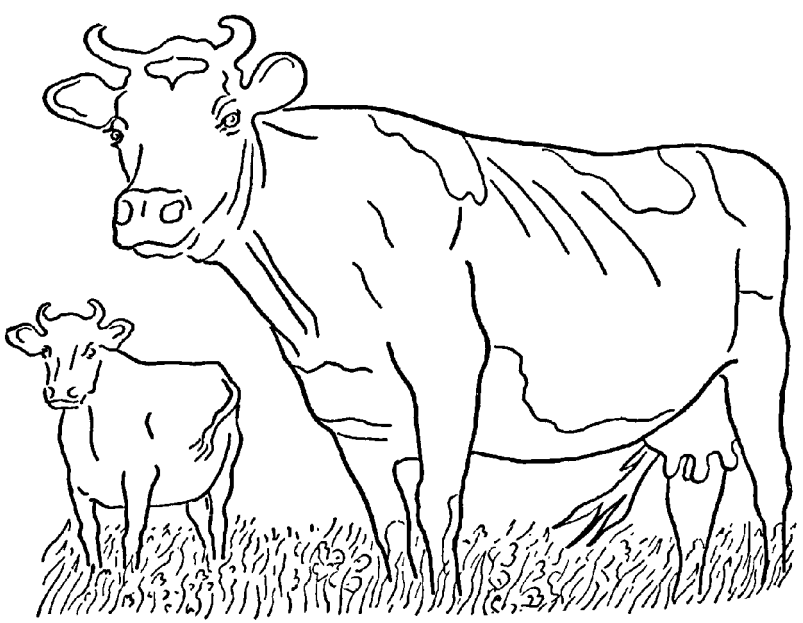
3. *Development of adequate improvements, power, and machinery (engineering)*: Essential adjustments are made to farm buildings. Necessary power, machinery, and equipment are acquired and used efficiently. Particular emphasis is given to fences, water supply for livestock, storage facilities, power and machinery for harvesting small grain, hay, and legume seed.

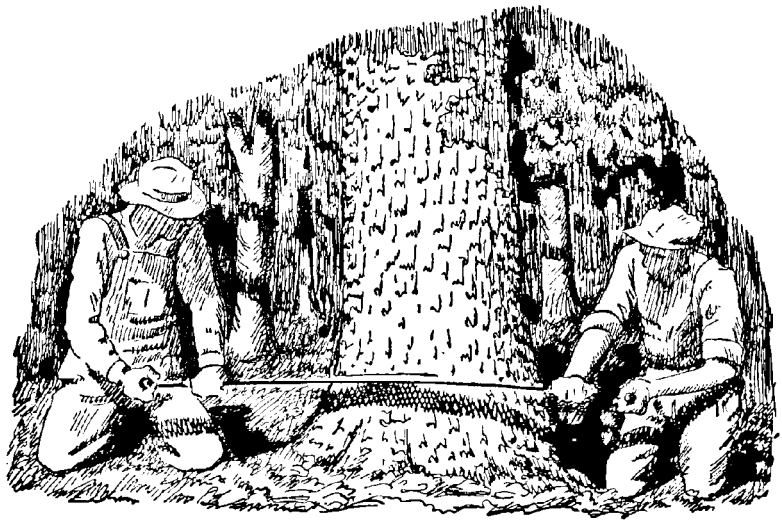
4. *Development of the farm family's skills, knowledge, and judgment (sociological)*: Aided by the guidance and educational assistance of the county Extension personnel, the members of the farm family develop and improve abilities in farm and home planning, in applying sound judgment to basic decisions, in wiser use of available funds, in combining enterprises

effectively, in buying and selling more effectively, in greater operating skill, in getting work done on time, and in "putting first things first." The garden is improved, and production and preservation of the essential foods for home use are increased. The health of the family is protected by improved nutrition, sanitation facilities, housing, clothing, better dental and medical care, etc.

5. *Development of cooperative community action:* Neighbors study the developments on test-demonstration farms. Individuals combine their efforts in cooperative use of the more expensive farm machinery and equipment, in developing needed marketing processes and storage facilities, and in developing and supporting needed schools, churches, social and recreational facilities.

As you will see later, George Medford and others in the Peckerwood community climbed this same ladder a rung at a time.





Forests

Except for a few remote and inaccessible areas, the fourteen million acres of forest land in the Valley have been cut over at least once and often three times. In spite of fire, blight, and the practice of clean cutting, these forests are still a major resource of the region and annually add two hundred million dollars to its income. This forest cover is of vital importance to the Big Wheel (hydrologic cycle), for it serves as a sponge-like blanket, absorbing and holding the flow of water down the watersheds. As you may remember, the engineers referred to the upper Hiwassee as a "flashy" river, characterized by quick fluctuations in water level, which were due, in part, to the destruction of the forests on the sides of the neighboring mountains. Here again the damage was started by the mismanagement of the Little Wheel.

It is almost too easy for us, today, to blame Jim Medford for selling off the white oaks and chestnuts that covered his western slope. The really sad part of that bargain was the fact that not only did the lumber leave the region, but the education

and training of Leland Medford never was a benefit to the community that made his schooling possible. From the Medfords' point of view there were literally trees "to burn," and as the old fields ran out they cut and burned them without a thought. When the big lumber companies set up their sawmills and rigged their logging equipment, following the little single track railroads up into the mountains, everyone for miles around enjoyed the temporary prosperity they brought with them. No one worried very much about what would happen when the last tree had been chopped down. Also, no one worried about forest fires or insect blights, for they were considered as acts of God and beyond human responsibility.

The second- and third-growth trees that make up the forests of the Tennessee Valley today are principally hardwoods. About one-third of these include various kinds of oaks. Another third is an assortment of hickory and maples, black gum and yellow poplar, black walnut and dogwood, persimmon and beech. The remaining third is coniferous—short-leaf, loblolly, and Virginia pines for the most part. Some white pine and hemlock, spruce and fir, can be found high in the mountains. There are a few bald cypress along the streams of the lower Valley, and here and there are valuable stands of red cedar.

In driving through the Great Smokies one gets the impression that almost all the forest lands belong to the government, but this is misleading, for out of the total four million acres only 17 per cent are public forest preserve. The rest is almost equally divided between the large private owners and those whose holdings are little more than woodlots. It is this 83 per cent of private owners that concerns the Tennessee Valley Authority.

As part of the broad program of reconstruction on the land the Forestry Division of the TVA set itself two general objectives: first, the reforestation of land no longer fit for cultivation; second, the protection and more efficient use of the

existing forest resources. As was stated in the original act establishing the TVA, one of its purposes was "to provide for reforestation and the proper use of marginal lands." The Medfords' western slope would be a good example of "marginal lands," for it was too steep and rough to plant in crops and if left exposed to the fifty inches of rainfall would fill the Peckerwood Branch with mud and silt which would ultimately fill the reservoirs downstream.

The second objective of the Forestry Division required a change in viewpoint on the part of the private owners of forest lands—a new way of evaluating their standing timber. It became the task of the Authority to demonstrate to these owners that trees are a growing crop and if that crop is correctly managed can yield a continuous profitable harvest of forest products. Besides these tangible profits, such practices would insure opportunities for recreational benefits, such as camping in the woods, as well as the protection of wildlife.

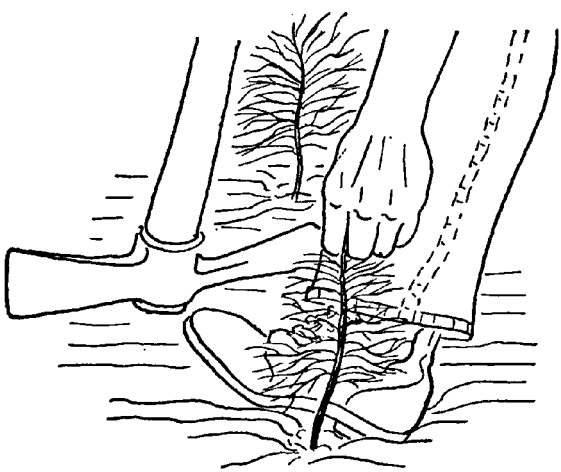
The big lumber companies that owned large tracts of timber within the Tennessee Valley began, in 1933, to follow the example of the state and federal governments in forest conservation. They recognized the value of fire protection and selective cutting and turned to the Forest Services for technical guidance. The real work of the Forestry Division centered on the problems of those farmers who either were fortunate enough to have a good stand of timber in their woodlots or were cursed with eroding hillsides only fit to be turned back into forests. Often both conditions existed on one farm.

Besides the owners of woodlots, there was another group whose sole income came from the forests—the operators of small portable sawmills. More than forty years ago the big permanent mills began closing down one after the other as the last of the saw logs within their area were turned into two-by-fours. Today three-quarters of the lumber in the Valley is produced by small portable sawmills. Just as the Valley farmer had

learned the old traditional methods of agriculture from his father, so these small sawmill operators had picked up what technical information they had by rule of thumb from an earlier generation. The Forestry Division had the same job of re-education that had confronted Harcourt Morgan.

A GENERATION OF TREE-PLANTERS

More than two hundred million trees have been planted in the Valley since 1933. To accomplish this the Authority has followed closely the same pattern used by Dr. Morgan in rebuilding the fertility of the soil. The tool in this case, instead of



phosphate fertilizer, was tree seedlings, and a similar program of test-demonstration plantings was started. For the first ten years the actual planting was done by the CCC, with the agreement on the part of the landowner to protect the young trees. By the end of the war these seedlings had begun to grow into sizable trees that covered the otherwise barren waste acres. These demonstration plantings spotted around the Valley have helped convince the private landowner that here was a way to increase the value of his property; here was a way to use those abandoned acres on which he still payed taxes. After all,

in that climate, with its quantity of sunshine and water, one might begin to harvest the short-leaf and loblolly pines in twenty-five or thirty years.

The TVA's major contribution in reforestation is the production of seedlings. To this end the Forestry Division established two large nurseries, one at Muscle Shoals, the other near Norris Dam. The fifty million seedlings that are raised here each year are available without charge to any landowner within the Valley who agrees to plant them properly and to protect them from fire and grazing. In connection with the nurseries, the Forestry Division has carried out some long-term experiments in silviculture (the art of producing and caring for a forest). What type of trees grow best in certain localities and on certain soils? What trees reach maturity quickest? What is the best method of thinning close stands of pines? Why was it that the black locusts never grew in the raw gullies on George Medford's western slope? Working with the local agricultural agent, TVA has advised not only individual farmers, but whole communities, as to how large tracts of land, made useless by erosion, can be turned back into forest. They have shown the woodlot owner how to estimate the number of board feet in a stand of timber, and they have taught schoolchildren the new methods of preventing forest fires.

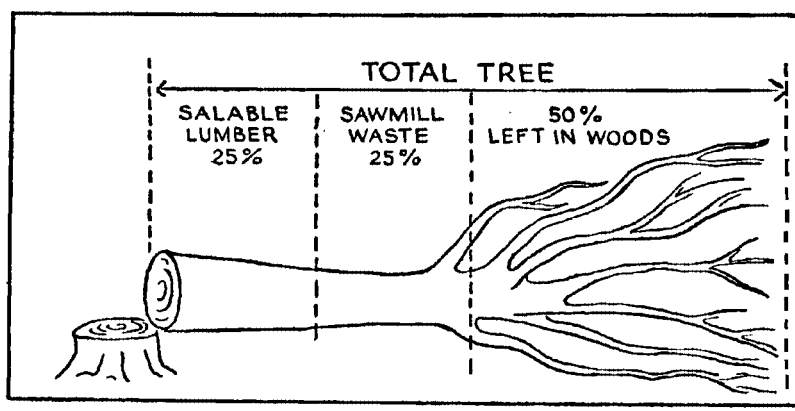
Much of the research done by the Forestry Division was directed toward a very practical problem: Is there a way in which the farmer can use his woodlot so that it will be a continuing source of farm revenue? Instead of following the old routine of cutting down the trees regardless of size and burning off the land in an attempt to increase his crop acreage, could it be demonstrated to the average farmer that by protecting his woodlot it might yield a larger profit? To use it as pasture was an obvious mistake—bad for the stock and ruinous to the young trees just getting a start. Within the Valley there is no single answer to this question, due, in part, to the wide range

of climate and marketing conditions, as well as the great variety of forest trees. But in general the Forestry Division can show that, if the farmer does his own logging and understands the principles of selective cutting, he can, during slack seasons, make a nice profit by supplying the small local mill with saw logs from his woodlot.

FOREST PRODUCTS

If one were to weigh these saw logs brought to the mill by the farmer and then weigh the cut planks and boards, it would be found that half of each log (by weight) was worth stacking in the lumber yard. The other half became sawdust, loose bark, and slabs. Nevertheless the farmer has to haul all

of it to the mill, and the sawmill operator can do little with it except sell the slabs for fuel. For the operator the waste does not end there: unless the lumber is correctly stacked for air-seasoning, he may well suffer another 8 per cent loss in board feet. Even after air-seasoning most hardwoods have to be kiln-dried, and so, by the time these saw logs reach the market as forest products, they will have gone through many processes. These small mills in the Valley cut out eight hun-



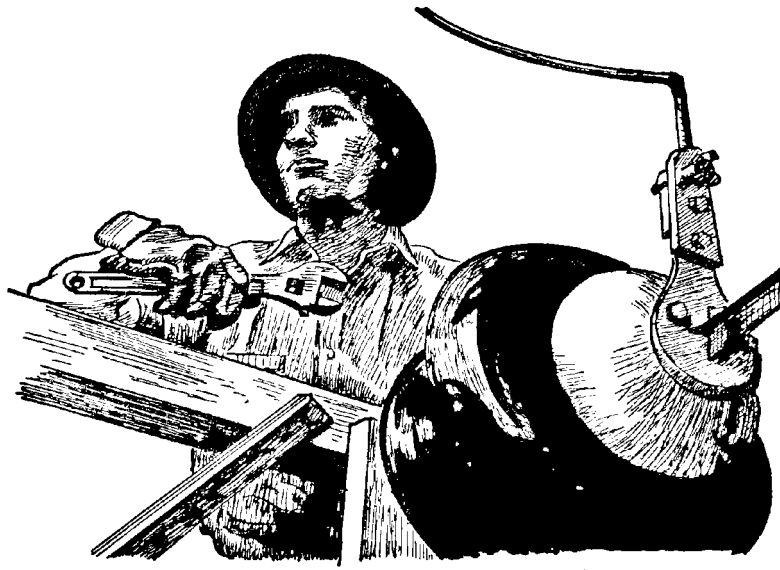
dred million board feet of lumber a year, and their success or failure as business enterprises depends on the technical know-how of the operators. The Forestry Division is interested in seeing that these processes are carried out with the minimum of waste—or, more important even, that this inevitable waste is turned into forest by-products that have a commercial value.

These Valley sawmill operators are a vital factor in the TVA's program of forest conservation. Unless the TVA can prove that the new methods of selective cutting and sawmill management are more profitable in the long run, there is always the chance that, under economic pressure, these operators may go back to the old ruthless routine of "cut out and get out," again leaving behind the stump barrens and the sure fire hazard of acres

of slash. Let us take one simple example. After careful study the Authority can now demonstrate to operators that they lose money in sawing up logs less than eight inches in diameter and make their highest profit on those that are fifteen to twenty-four inches. As this works out, they will pay the farmer more for his big logs, and he in turn will be more likely to select only the mature timber from his woodlot.

The TVA is attempting to carry out a realistic program of

forest conservation. It can succeed only with the wholehearted support and active participation of the owners of woodlands and the timber operators. Reforestation has only just begun, and it will take still another generation of tree-planters before the results can be judged. There are still thousands of square miles that must be protected with forest cover before the Big Wheel is in balance. To make the Little Wheel run fast and true requires more than just a state law prohibiting anyone from cutting down a tree unless it is over ten inches in diameter. Perhaps the answer is that the man with the ax must understand that it is to his own self-interest to use that tool wisely.



Power

Of all the new and startling programs announced by the TVA in 1933, the one that received the greatest popular attention and caused the loudest uproar was the plan for generating electric power and the method of distributing it to the people living within the Valley. After three years of terrifying economic depression it had become an accepted custom for farmers and manufacturers, white-collar workers and day laborers, businessmen and bankers, to turn to the federal government for help. In the confusion of those desperate times no one worried very much that the federal government, through the TVA, gave free fertilizer to the farmers and free seedlings to the landowners. But the idea of cutting the price of electric power and making it available to everybody—that was another matter.

Could the federal government, using taxpayers' money, set up an arbitrary "yardstick" for measuring electric-power rates? Was this a fair method of determining what the consumer should pay for a kilowatt hour of energy? Granting the fact

that Henry Ford had already proved that by lowering the price of his automobiles he had flooded every highway and byway with "tin lizzies," still, could not this "yardstick" be used by the authorities to rap the knuckles of the private utility companies? So went the argument, back and forth in the press and in the courtroom. Ten years later David Lilienthal, who had been in the very center of the fracas, wrote: "The sharp controversy over this matter can now be left to the historians and those rugged souls who enjoy hanging on to old issues." For the purposes of this book it is enough to show the vital part that the widespread use of electric power played in the reconstruction of the land in the Tennessee Valley.

"A refrigerator is a labor-saving device, or, put another way, it is your modern slave—only more so, as it works twenty-four hours a day. A kilowatt hour of electricity is roughly estimated as equivalent to ten hours of human energy. Last year the TVA generated eighteen billion kilowatt hours, which, translated into man-hours, gave the Valley an army of slave labor greater than anything ever dreamed of in Greece or Rome. This gigantic power resource was divided among more than a million consumers. It not only relieved them of the drudgery of small daily tasks, but also produced those goods and services that form the basis of our modern standard of living.

"In tens of thousands of farmyards and farmhouses you can see the change this power has already wrought. There are refrigerators in the kitchens. The water is carried by an electric pump instead of by women, young and old, with their water pails. There are hay driers in the barns, freezing lockers in the crossroads stores. There are community food dehydrators, small motors to grind feed, cut wood, turn a small lathe. Power is curing hams, processing sweet potatoes, cooling milk in the new dairies." [1]

[1] David Lilienthal, *TVA: Democracy on the March* (New York: Harper & Bros., 1944).

FROM DAM TO FARMYARD

Electric power is one of the end products that results from the balancing and controlling of the Big Wheel; the other two are navigation and flood control. The "white power" of the Tennessee River and its tributaries is caught and held by the dams. The powerhouses convert this energy to high-voltage current for transmission, and the high-tension transmission lines carry this current to the one hundred and forty-five distributing systems spread through the Valley. Within that region, these three stages of storage, generation, and transmission are completely owned and operated by the TVA. This wholesale power is bought by the retail distributors, made up of ninety-five municipal and fifty cooperative electric systems, which relay the power over their own lines to their local customers. In this way the power of the river is spread all down the Valley as well as being carried back into the mountains from which it started.

Some of these municipal systems were already in operation when the TVA took over in 1933. At that time only 3 per cent of the farms had electricity, and these few were situated near large towns. The greatest expansion in the use of electricity has occurred in the rural areas during the last seven years. It was the fifty rural cooperatives that dotted the country roads with poles and strung their wires into the most isolated regions, so that today eighty-two out of every hundred farms are hooked in on the line. These rural cooperatives were made up of merchants and farmers who, sick and tired of waiting for electric power to be brought into their neighborhoods, decided to go ahead and form their own distributing system. With technical help from the TVA and government loans through the Rural Electrification Act, they signed up their local subscribers and went into the business of retailing TVA power. This story can best be told by David Lilienthal:

"The farm people themselves are running this part of the job, through a particular kind of TVA-inspired cooperative, born in 1934 in the back of a furniture store in Corinth, a small Mississippi town. This was the unpretentious prototype of farm electricity "co-ops" that under the Rural Electrification Act (REA) have since spread all over the country. You have to attend the anual meeting of one of these cooperatives to understand the change electricity has brought. The motors and appliances tell only a part of the story.

"I have been at such meetings where throughout the whole day as many as two thousand farmers and their wives and children discussed the financial and operating reports made to them by their superintendent and board of trustees, and later, while we ate a barbecue lunch, watched new uses of electricity demonstrated. These membership "town meetings" have an emotional overtone, a spiritual meaning to people who were so long denied the benefits of modern energy and convenience which had become a commonplace to their city neighbors. The talk still turns to the hard days before "we won our fight," to the dark difficulties that had to be gone through before the crews came down the road, the poles were set, the copper lines strung, the lights went on." [2]

As those lights went on in the Valley, all manner of old ways and customs changed; not swiftly at first, but slowly, often clumsily, as the bright shiny appliances replaced the reeking oil lamp, the black sooty cookstove, and the three-legged caldron that stood in the backyard for the family wash. Today, no matter how far one penetrates into the mountains, nor how forlorn the old log cabin may look with its hand-hewn shingles all awry and the red clay chimney about to fall, one is very apt to see a brand-new washing machine standing on the tiny porch. Perhaps that washing machine symbolizes the success of the REA as well as anything could.

[2] Lilienthal, *TVA: Democracy on the March.*

At the start, of course, ridiculous situations occurred. For instance, there was Glen Lance, who had waited three years for the co-op to bring the line up to his farm at the head of Sweetwater Branch. Once the power was on, he kept the lights burning day and night, explaining, "I was so dern long gettin' 'em, I was scared to turn 'em off, afeard they wouldn't come on agin."

Uncle Dow Everett's predicament was somewhat the same after the electricians left. He did not know how to turn off his one 75-watt bulb hanging on a drop cord in the middle of the

cabin. When it came time for bed he blew on it and then he fanned it, but it would not go out. Finally, about midnight, he put the bulb in a bureau drawer, closed it, and got some sleep.

One of the directors of the Blue Ridge Cooperative, Fred O. Scroggs of Brasstown, N.C., storekeeper, collector of mineral specimens and Indian relics, put the matter briefly: "Before we started our cooperative, part of this country was served by a private utility. At that time only two per cent of the farms here were electrified. Now over ninety-six per cent are. We paid eleven cents per kilowatt. Now we pay three. Some relief. Since the coming of our cooperative our county has forty-four Grade A dairies. None in the beginning. Farmers were selling sour cream."

ELECTRICITY SPINS THE LITTLE WHEEL

Superphosphate, tree seedlings, low power rates—these were the three tools used by TVA in carrying forward its program of reconstruction on the land, and of these three the last was the most spectacular. In terms of the Little Wheel it brought all kinds of new activities and enterprises to the Valley. As already explained, the stepped-up war schedules for aluminum production never would have been maintained but for the abundant and continuous supply of TVA power. "But aluminum is only one example of the war use of power produced by TVA. Six basic materials plants, located here since 1933, before the outbreak of the war in Europe, alone use as much electric power as all the people and all the industries of Pittsburgh or Boston, and up and down the Valley are many smaller industrial plants, their furnaces heated, their motors turned by the controlled waters of the river. They are processing metals, food, fibers, timber products, chemicals, producing airplanes, boilers for ships, gas masks and explosives. TVA's own chemical plants are now using power for the same military purpose:

to make the ingredients of smoke screens, explosives, incendiary bombs, synthetic rubber. And that is where most of the power of the river will continue to go until the war is won." [3]

Later, the government's choice of Oak Ridge, Tennessee, as a site for one of the atomic-energy projects was largely determined by the fact that the TVA was in a position to make the required power available. At the end of the war, following V-J Day, there was a brief dip in the demand for power, but this represented only the momentary shift to peacetime production. From then on it has been a race to supply the new customers, both private and industrial.

As you know, the power potentialities of the Tennessee River had been recognized long before the TVA, but in 1933 the high rates and the low use gave no indication as to the future demand for electricity. For many years there were dire predictions that there was no conceivable way of using all the power that the TVA was planning to generate—just another instance of government waste. Today the winds of criticism blow from the opposite quarter, as the need for power begins to exceed the total generating capacity of the TVA plants—at which point the government is then charged with inefficiency and inadequate planning. To say that this change-about was entirely caused by the war is not the complete answer. The war certainly speeded the construction of the whole hydroelectric generating system and brought the eighteen dams to completion years ahead of schedule. But the answer to the 18 billion kilowatt hours of electricity that were used in the Valley during 1951 can be traced directly back to the TVA's original and basic policy of making electric power available at low rates to everyone living in the Valley.

[3] Lilienthal, *TVA: Democracy on the March.*

XII. Clay County Chronicle III

(*1942-1950*)

EVERYONE in the neighborhood of the Peckerwood Branch was very pleased that Peggy Pennington had come back to live at the old Jackson place. There were one or two other families that had had to move from the Chatuge reservoir site and had purchased small farms tucked away, here

and there, on the side of the Tusquittee Mountains. Many of the old farms in that area, like the Hankinsons', the Lashers', and the McDuffys'—had been divided and subdivided among children and grandchildren so that by now there were more individual farms and more people living in that section of the country than ever before.

The little schoolhouse was overcrowded, and the few children that went to the high school in Hayesville either had to board with relatives or travel eight miles over winding dirt roads. Long ago the Methodist church had burned down, and it had now become the custom at the Baptist church to leave the front doors wide open in fair weather, so that the rest of the congregation sitting on the steps outside could hear the sermon. Peggy Pennington had persuaded the telephone company to carry the party line another mile up the road to her house, but the majority of the community was without service. Although Hayesville had had electricity for many years, the power lines extended only half a mile beyond the town limits. As George Medford said, "there sure ain't anythin' to keep the children here but the scenery. Guess if you're born in the mountains though, you're not happy anywhere else."

The old Jackson house was sound and well built, and by the time George and his son Charley had finished renailing the siding and touching up the paint, Peggy and her sister Silvia had repapered the upstairs bedrooms and arranged the old Pennington rosewood furniture. The family settled in comfortably. Young Charley Medford came down every morning and night to look after the stock, turning them out into the little makeshift pasture near the barn. The first warm day in March the big Holstein cow pushed through sagging rail fence and, followed by the two heifers, wandered off to graze among the alder bushes that lined the stream. It took George and Charley, with Peggy's help, all afternoon to round them up, and it was almost dark before they got the last one in the barn.

"Well, that settles it," said Peggy as they walked back toward the house. "I'm going to clean up these fields and get this farm back in shape. There isn't any pasture up on the old place, and everyone says this was one of the best farms."

"But, Peg, how are you goin' to do it?" asked George. "All the young 'uns are bein' drafted. There won't be a man left to help you. Wouldn't surprise me if young Charley here were called up in the next few months."

"That's just why I want to get started," said Peggy with determination. "Charley, if I bought a tractor, how long do you think it would take to get these bottom fields ready to plant?"

"Gee, Aunt Peg, that would be somethin'," said Charley, trying to hide his excitement. "Now if we got a brush-plow attachment, I know I could get them two lower lots ready before corn plantin'."

Later that evening, after Charley had gone to bed, Peggy explained to George that there was enough money left over from what the government had given her for the Pennington farm to buy the tractor and start farming.

"Well, it's your money and I can't stop you, though it seems mighty risky to me," said George. "I'll do what I can to help, but that boy will be in the Army by next fall. What then?"

"If we're doing as well as I hope we will, they'll let him stay. You wait and see. Someone besides the womenfolks have got to raise enough to see us through this war."

Peggy Pennington was right. Charley's experience while working on the dam had taught him how to handle machinery, and that fall there was a good harvest of corn. The local draft board deferred Charley as an agricultural worker, and as soon as this was settled Peggy bought two more cows.

1943

Two weeks before the meeting the farm agent had sent out notices to everyone in the county, inviting them to come to the

high-school auditorium in Hayesville to hear about the TVA's new test-demonstration program. There would be speakers from the State Agricultural College in Raleigh, a representative from TVA headquarters in Knoxville, motion pictures, slides, and finally ice cream and cake served by the ladies of the First Methodist Church of Shooting Creek. The meeting started at seven o'clock, so Charley hurried through the evening milking, bolted his supper, and was ready to drive his aunt and two neighbors into town by six. George Medford stayed home, pretending that he had a cold, but when they returned they found that he had come down from his own place and was sitting near the stove, awaiting their return.

"Well, son, what are they up to now? Gonna show us how to farm the way they did ten years ago when they dumped all that lime on the barn floor?" asked George.

"No, Paw. It ain't like the last time," replied Charley in the same slow, grave manner as his brother Bob. "They'll help on the lime and they'll give us a new kind of fertilizer called superphosphate. But from there on we gotta do it ourselves. Aunt Peg, what's the name of that clover the farm agent recommended?"

"Ladino clover and orchard grass," said Peggy. "George, they want us to give up growing corn on the side hills and turn it into pasture. They showed some right pretty pictures of farms over in Tennessee—all scalds and broom grass six years ago and now they are raising good healthy stock on green pastures."

"Didn't no one stand up and tell 'em you can't grow grass in these parts?" cried George. "By thunder, I should have gone. Super this or super that, it won't make no difference. I bin through it all. We'll be back again makin' sour cream that ain't fittin' for the hogs."

"Well, George, there are some good farmers over by Meyer's Creek and Sweetwater Branch and they're going to try it. They

volunteered to test out the new fertilizer. You know, Mike Andrews—and he's a smart one—signed up as a test-demonstration farmer," said Peggy quietly.

"I don't care how smart Mike is. It'll ruin him. Wait till he gets a dozen or more head o' stock on his place and then has to buy pea hay from over in South Carolina. That'll be another kind a demonstration," said George bitterly, standing up to leave. "You didn't sign up, did you, Peg?"

"They're not ready for us yet, George. Maybe in a year or two. But Charley and I are thinking of putting in a piece of clover on that sloping field back of the barn."

"Certainly should've gone to that meetin'," muttered George as he picked up his lantern and started up the road to his own farm.

1945

George Medford had been lucky enough to get one of the last farm trucks delivered in the county before the war regulations shut down. He had also sold off a dozen hogs at a good profit and began to realize that he could now sell almost everything he could raise. But the old worn-out farm equipment was beyond repair and the hardware supply company in Hayesville had been cleaned out, even to nails. Without them he could not patch the dilapidated chickenhouse, and, just as he had expected, the 'possums ate up most of his baby chicks that spring.

Like everyone else that was left in the county, there was not much George could do but sit the war out and wait for better times. Besides working for his aunt, Charley was using the tractor to help other farmers in the county, and George knew that if his son came home he would be drafted. By now Bob Medford was a sergeant and had gone through the European campaign without a scratch. In the summer of 1945 he wrote his father that he hoped to be sent home in the early fall. From then on George Medford began planning all the things he was

going to do on the farm when both his boys were back to help him.

It was that summer that the farm agent arranged for a tour of the test-demonstration farms in the county. George had sold Mike Andrews a calf two years before. After unloading it at the Andrews' barn, Mike had wanted to show George a new field of red clover that was in full bloom, but George pretended that he had to hurry home. Ever since, he had been waiting for some excuse to go back and see what Andrews was really doing on his farm. So it took little persuasion on Charley's part to get his father to join the procession of old cars and farm trucks that started out that hot August morning from the courthouse square in Hayesville.

The first two farms that they visited were over by the Sweetwater Branch, and as they walked across the fields to inspect a new pasture seeding, or squatted in the shade of the barns after looking at the stock, the talk turned on their common interests, such as the price of corn, the revival meeting over at Murphy, or Paul Cranston's albino calf. Now and then one of the men would ask the farm agent or TVA representative a direct question, but for the most part they stood quietly and listened, nodding their heads in approval while the test-demonstration farmer explained how he was arranging the rotation of his fields and crops or what he proposed to do next spring.

On the way over to Meyer's Creek they stopped and ate their picnic lunches in an oak grove on the bank of the Chatuge reservoir. After everyone had finished and stretched out in the shade, the man from TVA began to tell them about some of the Authority's postwar plans for Clay County. He explained that the county had lost much of its best land in the building of the reservoir, and though the TVA was anxious to increase crop production on all the farms in the area, nothing much could be done until the war was over and the plants at Muscle Shoals began making fertilizer again instead of explosives. He pointed

out the need for cover crops like alfalfa and clover, which would help rebuild the soil and keep the fertilizer from being washed away.

After a long pause he continued, "In the meantime, gentlemen, there is something that each of you can do. Now let's take Meyer's Creek where we are going. It's what we call a watershed community. All the little brooks and streams on those farms up there run into Meyer's Creek, and that empties into the reservoir just above here. These watersheds are nature's own division of the land, and we have to take them into account. What the TVA and the Farm Extension Service is interested in is to see you fellows form your own watershed community associations. They'd be something like a cooperative—might even become one. Instead of making a test demonstration on a single farm unit, we'd like to set up whole community test demonstrations. This would simplify the ordering of lime and phosphate. It would make the farm agent's job a lot easier—wouldn't it, Ken? The TVA will help you get started on the planning of the first year's program, and Ken Roberts will be there day and night to answer questions and give you all the technical advice he can. But it is up to you fellows to form your own associations or community groups."

Every man had a question to ask, and in the still, shimmering heat of the August afternoon the oak grove rang with voices. After an hour of questions and answers the picnickers gathered up their things, and the caravan of farm trucks and mud-spattered cars moved on up the winding road bordering Meyer's Creek. Last of all that afternoon they stopped at Mike Andrews' farm. After going through the dairy barns and the creamery, Andrews showed them his new chickenhouse in which he raised a thousand broilers. From there they went on to inspect the permanent pasture, and one field in particular. Ken Roberts, the farm agent, jokingly referred to it as "Professor Andrews' scientific experiment."

"Now, gentlemen, I'll admit that's a right strange-looking field," said the TVA representative as he rested an elbow on the fence post and pushed his straw hat higher on his perspiring forehead. Then he continued with a broad smile, "As Ken says, this is Mike's own experiment. When he seeded this land last fall he divided it into four equal squares of one acre each. This nearest one has two tons of lime and twenty pounds of superphosphate. The one on the right has the same amount of phosphate but no lime. That square yonder has lime and no phosphate, and the last batch has nothing."

"Mike, you're sure that's all planted with the same batch of seed?" George Medford called out as he gazed in wonder at the four squares—one a dark rich green, the other two light and yellowish, and the last with barely enough blades of grass to cover the ground.

"Yep, George, that all came out o' the same two-bushel sack," replied Mike. "If you don't believe me, ask Ken. He sat here half a day and saw me sow it."

After the glaring hot day in the open it was pleasant to reach the cool late afternoon shadows cast by the Tusquittee Mountains. George Medford drove the truck slowly along the winding dirt road while he listened to his two neighbors, Ben Hankinson and Kit Lasher, talking over what they had seen that day. He agreed with Ben, who claimed that if Mike Andrews hadn't made money on those broilers he never could have built up his dairy herd. Kit Lasher still could not believe that those twenty pounds of superphosphate could make that much difference. Finally all three discussed the possibility of forming a farmers' association in their part of the county.

It was almost dark by the time George stopped the truck at the crossroads near the Baptist church. As the two men climbed down and started up the road leading to their farms, George called after them, "What about callin' it the Peckerwood Community Association?"

"Sounds right to me," Kit Lasher yelled back over his shoulder, waving good night. "T'ain't fancy but anybody will know where to find us."

1946

Although the Medfords' way of life had long since been reduced to a bare subsistence level, it nevertheless had withstood the desperate makeshifts of the depression and the general turmoil of war. Hidden in a cove of the Tusquittee Mountains, their little farm seemed to remain forever undisturbed, a forgotten, sheltered niche around which these great social forces swirled but did not enter. When Sergeant Bob Medford finally returned from the Army, everything was much as he had left it, for the family still lived in the two ancient cabins with the "breezeway" in between, they still used the original outbuildings and barns that Uncle Tom Medford had hewn from virgin timber, and they still drew their water from the brook in the yard. But Bob soon found that during his four years in the Army one important change had occurred. His father no longer believed in the old routine methods of farming.

In January 1946, a week after Bob got home, a meeting was held in the little weather-beaten two-room schoolhouse. Even with the help of the farm agent, who drove miles and miles over muddy, rutted roads, stopping at every house and cabin in the district, only about a dozen farmers with their wives and older children trooped in that night to warm themselves at the schoolhouse stove. They wedged themselves into the little desk-benches that lined the classroom, while the TVA representative showed a series of colored slides and told them how other groups of farmers within the Valley had formed their associations. After the lamps had been relighted the farm agent went on to explain the test-demonstration program and how it was working out in other parts of the county.

Before the meeting broke up that night George Medford

was elected chairman of the new Peckerwood Community Association and Peggy Pennington was named secretary. She carefully wrote down everything that was said, including a fiery speech by Ben Hankinson, who as a staunch Republican was "dead agin any guvment interference and the wastin' of taxpayers' money." But nobody paid the slightest attention to Ben, and as they said good night everyone agreed that it was a fine thing to have the association and they would see to it that their neighbors came to the next meeting.

Early that spring the Blue Ridge Electric Cooperative carried its lines up the road beyond the Pennington house. George Medford, as chairman of the community association, had no choice but to wire the cabins and barn and become a subscriber. The first night that the lights went on George pushed his chair back from the supper table, claiming that the glare gave him a headache. In spite of the damp chill of the spring night he went out into the gloom of the porch. Bob and Charley followed him.

"Paw, I was talkin' with Aunt Peg the other day," Charley said somewhat hesitantly. "She thinks she can get along without me now that Boicy Lasher will work for her by the day. 'Ceptin', of course, for the tractor work, like plowin' in the spring and helpin' with the hay. You see, me and Bob wants to go in for raisin' broilers, and now that we've got the 'lectricity we'd like to git started."

"Everyone says that Mike Andrews done well with it," replied his father. "But, boys, that means a real poultry house."

"I've got some back pay comin' from the Army and Charley has saved a little from what Aunt Peg give him," said Bob solemnly. "Now I've been down to the farm agent's and looked over the plans for one of them chickenhouses. I figure me and Charley could build a big one in about a month's time."

"Bob, have you done give up the idea of goin' to the agricultural college in Raleigh?" asked George. "After all you're a veteran, and it's due you."

"No, Paw. I'm plannin' to go in June. But Charley and I think we can get a good start by then, and from there on he can look after it while I'm studyin'."

"Well, boys, I think it's a good idea and I'll be glad to help you both. It's about time somethin' new was started on this farm, anyway."

By the first of May the large poultry house had been completed and the electric brooders installed. More than a thousand baby chicks were busily pecking around in the clean sawdust. Ken Roberts stopped by at least once a week while the construction was going on, and by the time the baby chicks had arrived he had put Bob in touch with a wholesaler in Atlanta who guaranteed to take all the broilers the Medfords could ship.

During these visits of the farm agent, Bob discussed the possibilities of starting a dairy on the old Medford place when he had finished his two years at Raleigh. As Roberts explained,

the main problem was to establish enough permanent pasture-land and to increase the hay production so that the farm could support at least a dozen milk cows. By the use of Peggy Pennington's adjoining fields, Roberts thought it might be possible. With this much encouragement, Bob knew the courses that he would concentrate on when he got to the agricultural college.

1948

George Medford had been brought up to do without and to pretend it did not matter. But that was over now. It no longer paid to patch the old tools and equipment in an attempt to make them serve beyond their time. It was no longer a question of just "managin'" some way to get enough to eat, dress the children, and pay the taxes. Looking back on it, George often wondered just when the change came. Was it when Bob got back from the Army, or did it start with the first meeting of the Peckerwood Community Association? Maybe one could say it all started the day they brought the electric lines into the barnyard. Ever since George had worked on the Chatuge reservoir six years before, he had felt that changes were coming. Now he knew that those old manners and customs with which he was familiar meant very little to his sons.

After he and Charley had sold the first five hundred broilers, there was nothing for it but to enlarge the poultry house. In a year's time they were selling crates of hatching eggs, as well as one hundred and fifty broilers a month, and always there was a demand for more. A carload of lime and phosphate had been delivered on the siding at Hayesville addressed to the Peckerwood Community Association, and this had to be trucked out to the twenty different farms that had signed up on the test-demonstration program. The association had made substantial savings for its members by buying seed from a wholesale concern in Chattanooga. Charley had put in five acres of red

clover, and the last time Ken Roberts looked at it he figured that it would make a ton and a half or more to the acre.

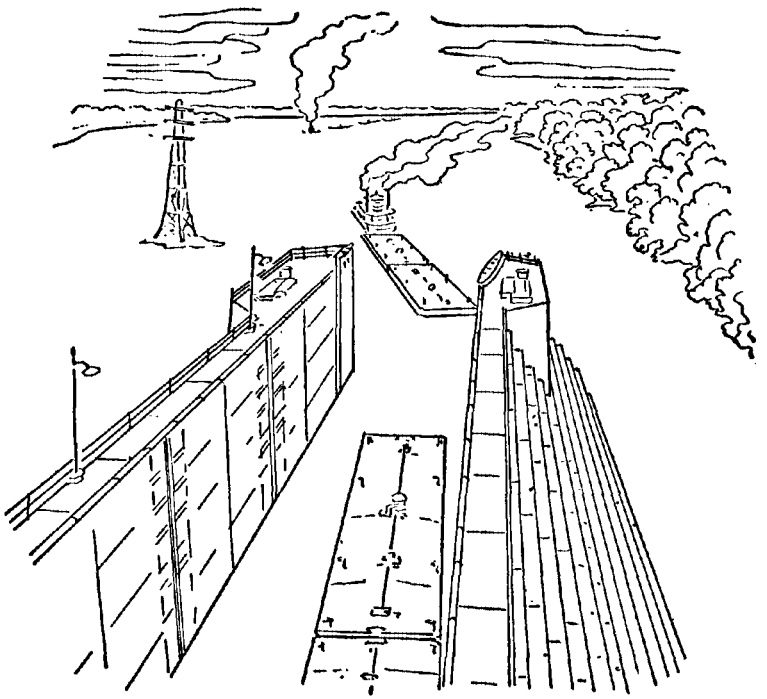
Busy as George was with all the new operations on the farm, he still had his duties as chairman of the community association. If it had not been for his sister Peggy, who did most of the work for him, he probably would have given up the chairmanship, for even after two years he was always shy and embarrassed at having to address the quarterly meetings. Often there was violent disagreement, followed by harsh words and threats of resignation. George himself nearly resigned the night they tried to throw Kit Lasher out of the association for having used his allotment of phosphate on his corn instead of planting more pasture. Finally Kit had explained that his three cows had been struck by lightning while standing under a tree and "he didn't need no more pasture." Even Ben Hankinson agreed with George that Kit should be reinstated on the program. During these two years Ben had become an enthusiastic member, to the point that he had donated a piece of land near the schoolhouse so that the 4-H club could build a playground.

It was hard enough for George to talk over farm problems with men he had known from childhood, but it was all Peggy could do to get him to preside now that the ladies of the community also had an active program. The first year they demanded that the schoolhouse be painted inside and out and that running water and flush toilets be installed. At the same time they arranged with the state health authorities to have all the children inoculated against typhoid, diphtheria, and smallpox. It seemed that they were always arranging something—a barbecue picnic for the folks from the Meyer's Creek Association, a lecture on home economics, a TVA demonstration on new electrical equipment for the farm. As George said, "Might as well try to stop a bulldozer with a willow wand, as to turn them womenfolk once they get set for action."

Six months before Bob Medford finished his two years at

the agricultural college he persuaded his father that the old log barn had to be torn down. Large and solid as it was, it still would not hold the seven and a half tons of fine clover hay George and Charley had harvested off the five acres. Next year there would be fifteen acres, and that harvest was far too valuable just to be stacked outdoors. Besides, if they were going to produce Grade A milk, they had to comply with the regulations, which required concrete floors, metal cow stanchions, and all the rest. By the time the new barn was finished with its shiny metal roof, its electric milk-cooling machine and hay drier, Bob Medford was home to stay.

He took Ken Roberts' advice and started slowly, buying a cow here and young heifer there, for he knew that it would take time to build the kind of herd he wanted. George Medford was glad to have his oldest son run the farm and, as the dairy business went ahead, he spent more and more of his time roaming the mountains with his gun or spending the day with Kit Lasher, fishing on the Chatuge reservoir. Of all the changes that had come, the destruction of the log barn seemed to bother George the most. It was as though something of himself had been destroyed, for that clumsy, gaunt structure was a symbol of the old ways that he had learned from his father, and every mark of the ax on the heavy white oak logs spelled out the early mountaineer tradition brought there by Thomas Medford.

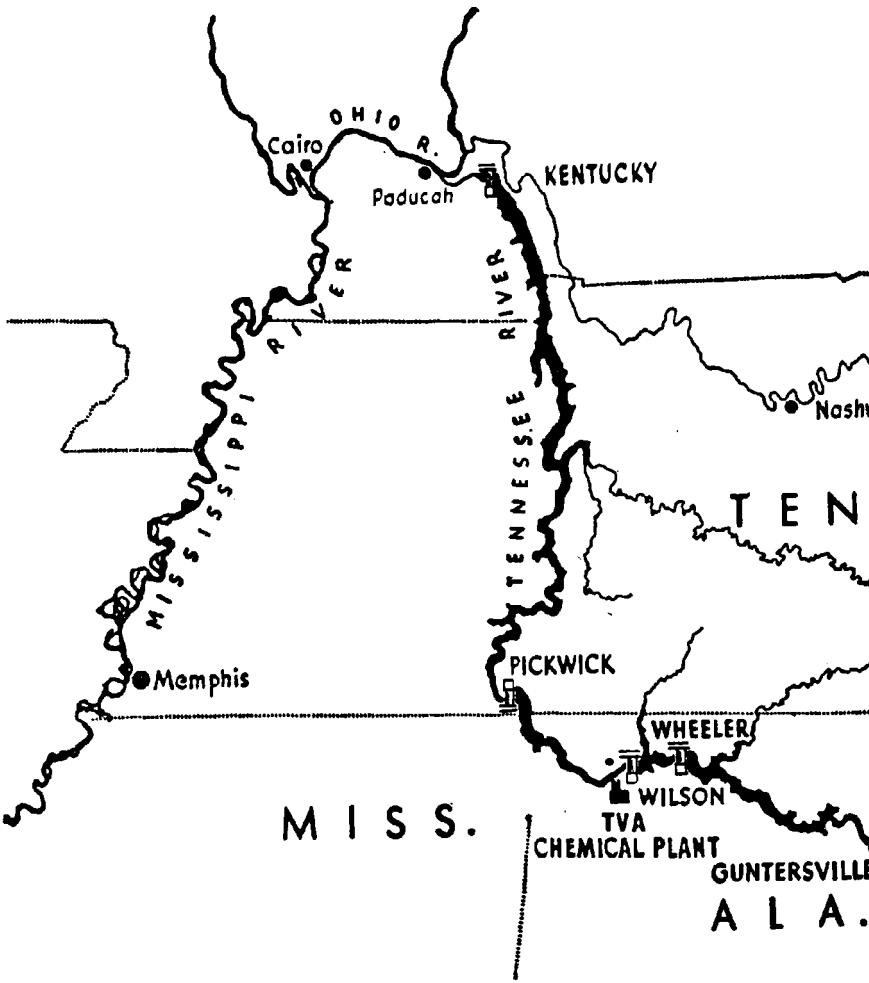


XIII: The New Resources

". . . and all the rivers run to the sea . . ."

River

THE 9-foot channel from Knoxville to the Ohio was completed in 1945. As you remember, the Chickamauga Dam was finished a year before the war (1940), but to bring the navigable channel as far as Knoxville required two more main river dams upstream, the Watts Bar and the Fort Loudoun. While these two were being built on the upper Tennessee, the giant Kentucky Dam, 600 miles downstream, was nearing completion after six and a half years of construction. This last dam, 200 feet high, created an inland lake 3 miles wide and almost 200 miles long.


OHIO R.
Cairo
Paducah
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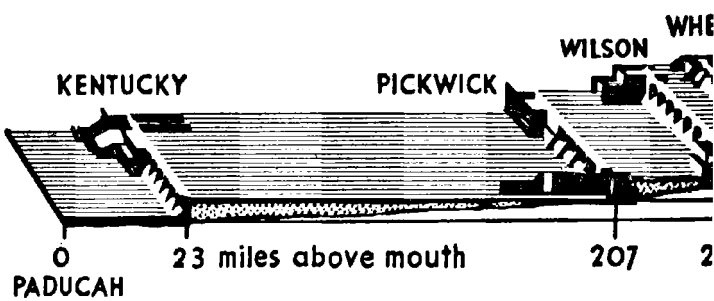
CHEMICAL PLANT
MISS.
GUNTERSVILLE
ALA.


KENTUCKY
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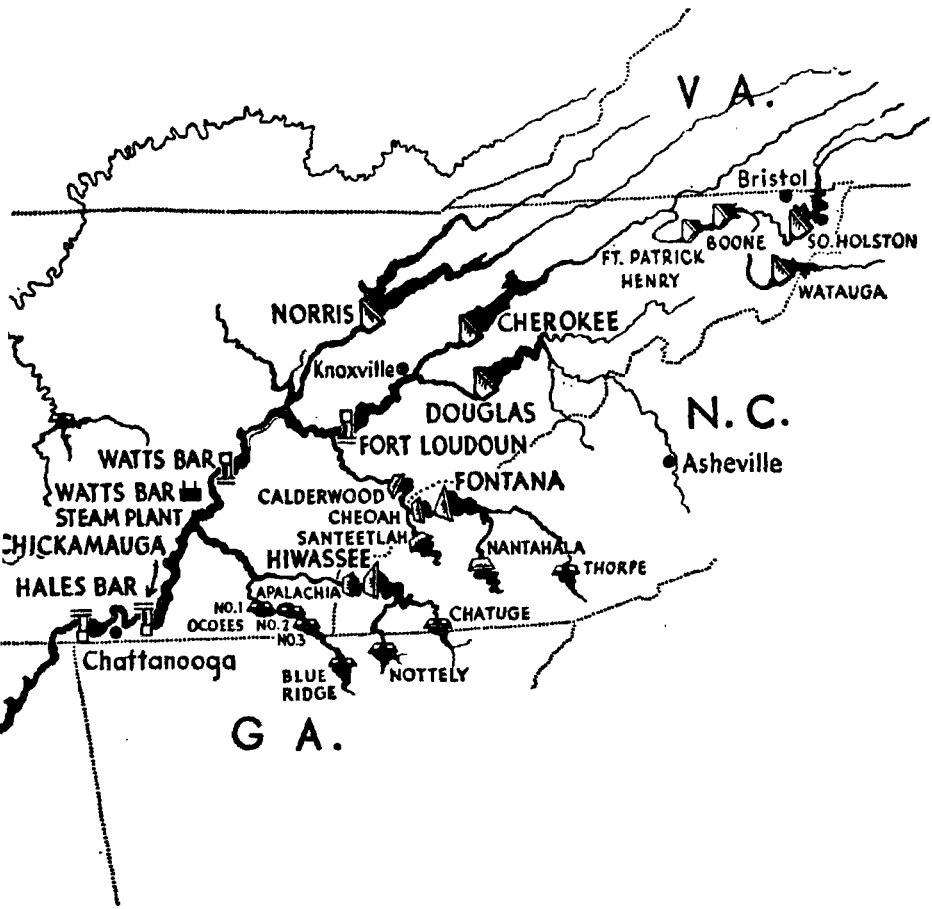
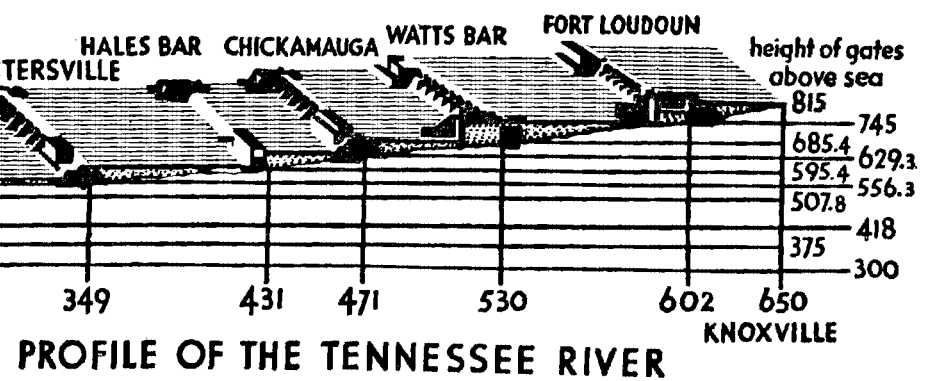


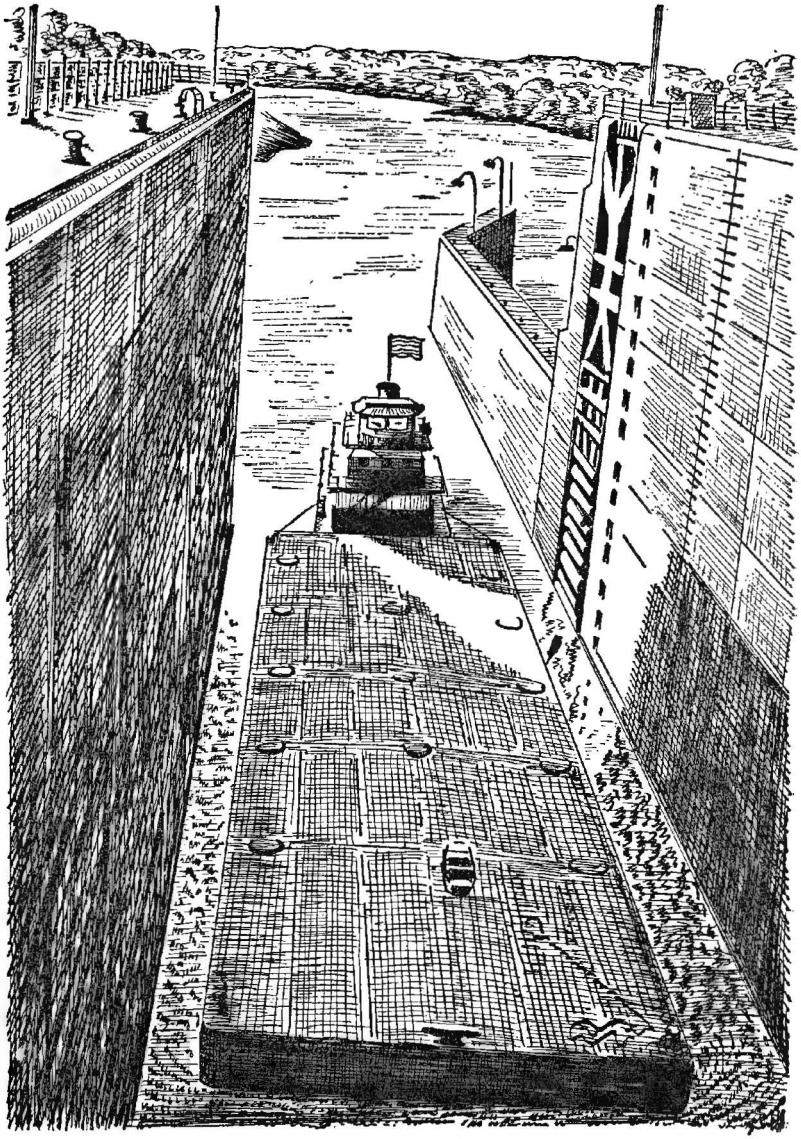


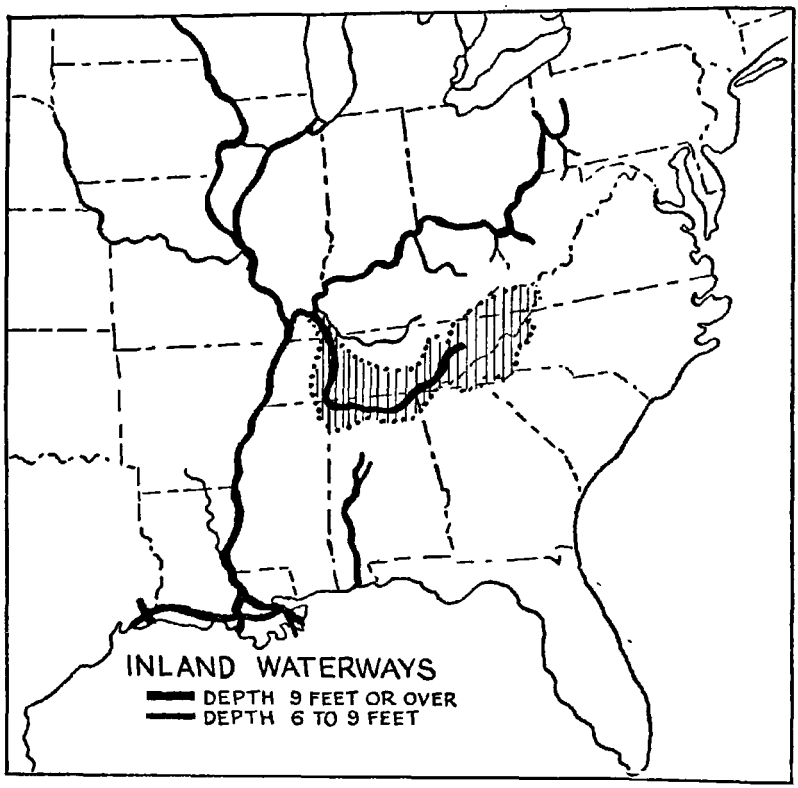
PROFILE OF THE TENNESSEE RIVER

Although today's river traffic follows a definite channel patrolled by the Coast Guard and marked by buoys and lights, the word channel is misleading, for that brings to mind a narrow waterway, whereas the trip from Knoxville to Paducah is a voyage down nine lakes linked together by giant locks at each of the main river dams. As the boat glides into one of these locks and the upstream gates are silently closed by the electric motors that operate them, one has the feeling of sitting in a rowboat in a bathtub. Then, as the water drops, the walls seem to rise above the deck, the landscape disappears, and in a few minutes you have dropped to the bottom of a huge rectangular well, whose dripping concrete walls rise 70 feet directly overhead to the little patch of blue sky. Then the downstream gates open majestically and there, stretching ahead as far as you can see, is another placid lake.

Within the last seven years millions of tons of freight—in the form of iron and steel, coal and chemicals, grain and automobiles, and, most important of all, oil—have moved up and down these lakes on regular schedules. These products are shipped on huge steel barges tied together in tows and are either pushed or pulled by small powerful Diesel tugs. During the summer there are a few excursion steamers on the river, like the *Gordon C. Greene,* which take parties from Chattanooga down to Paducah and back. If occasionally an old sternwheeler puffs by, one is reminded of the old days on the river, when the "Suck" and the "Boiling Pot" were real hazards and the easygoing "chicken boats" nosed against the bank while the hogs and heifers were loaded aboard.

Although the Tennessee River now carries fifteen times the freight that it did in 1933, it may still be another eight or ten years before it is used to full capacity. During the last war, though still unfinished, it proved its worth as part of the national defense program, in helping to relieve the desperate petroleum shortage in the Northeast. Instead of risking the





dangers of the submarines in the Caribbean, the oil barges moved safely up from New Orleans to Chattanooga, where their vital cargo was transferred to tank cars and shipped east by rail.

The Tennessee River now brings to a large inland section of the agricultural South the great advantages of cheap water-borne transportation. As you can see from the map, the old dream that brought the Georgia cotton planters streaming into northern Alabama has now come true and the Valley has become an active part of the great midcontinental waterway system.

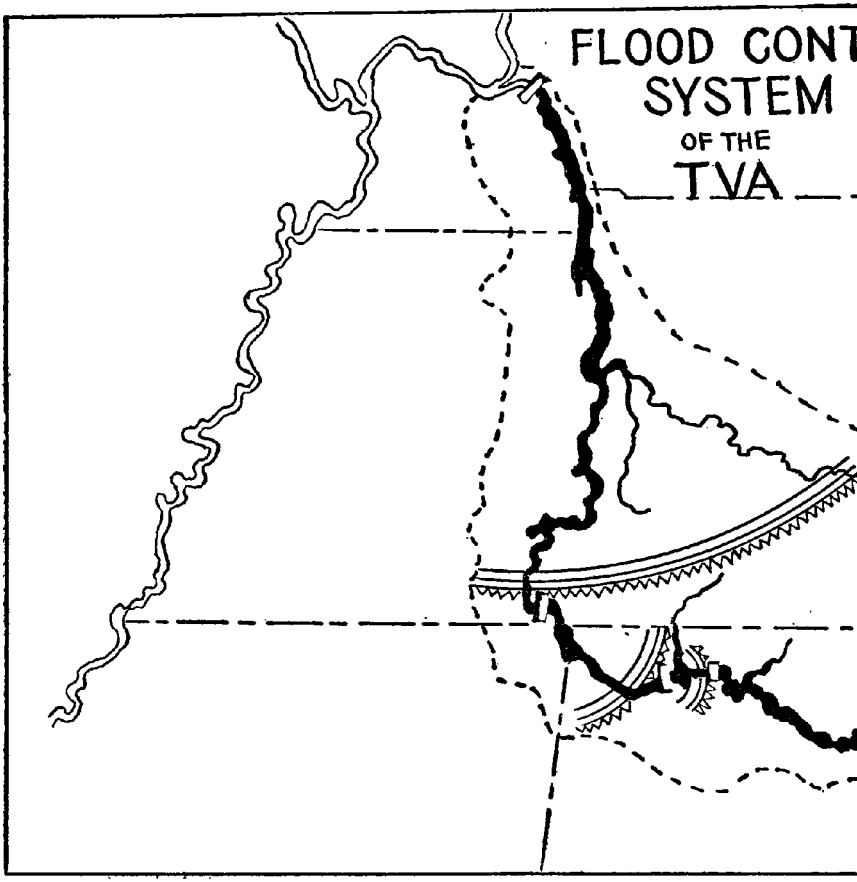
In its nineteen years of existence the Tennessee Valley Authority has built eighteen dams and has two more under construction. The completed TVA dams, along with eight that

were already installed before TVA and two that were built by the Aluminum Company of America a few years ago, comprise the highly developed system of twenty-eight reservoirs that are operated as a unit.

It is now possible for the TVA to control and regulate the flow of water in the Valley as accurately and as efficiently as filling or emptying a bathtub. But this is not as simple as it sounds, for the discharge of water from the Tennessee Valley can range from 5000 cubic feet of water a second to 500,000. How then, in an average year, can the 60 billion tons of water that pour into the Ohio be controlled?

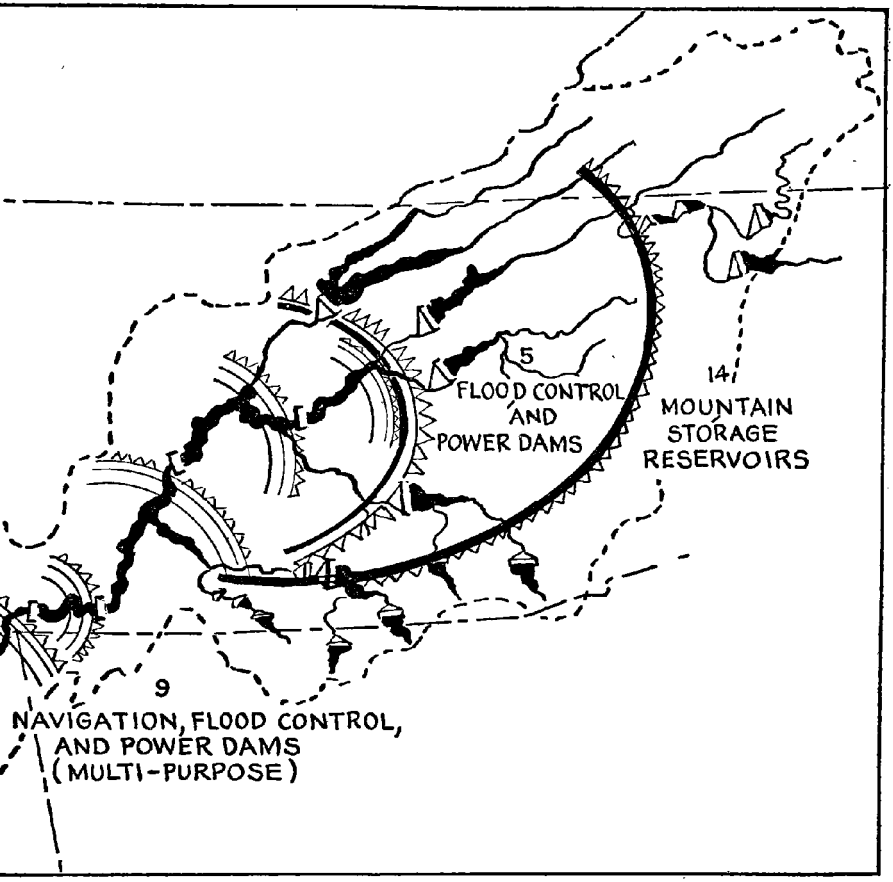
As suggested earlier, the over-all plan is somewhat similar to the military strategy of "defense in depth." The main Tennessee River drops 500 feet in 600 miles, and along that stretch there are nine great barriers, beginning with the giant Kentucky Dam near the mouth and ending with the Fort Loudoun Dam below Knoxville. The next line of defense is formed by the five high tributary dams, as follows: Norris blocks the Clinch and Powell Rivers; Cherokee holds back the waters of the Holston; Douglas dams the French Broad; Fontana commands the Little Tennessee; and the Hiwassee regulates the river after which it has been named. Above the tributary dams are the mountain reservoirs that catch some part of those 60 billion tons; by holding them more than 1000 feet above the lowest level of the river, they not only equalize the stream flow but become the giant storage batteries of "white power."

These twenty-eight installations, strategically located on the Tennessee River and its tributaries, form three groups or tiers of fortresses that defend the Valley against floods. These dams and reservoirs check and break up the attack of excess runoff, distributing it more evenly all down the Valley, changing it from a destructive force to an asset. This remarkable system of flood control is one of the most outstanding and original contributions of hydraulic engineering in our time. The designing,



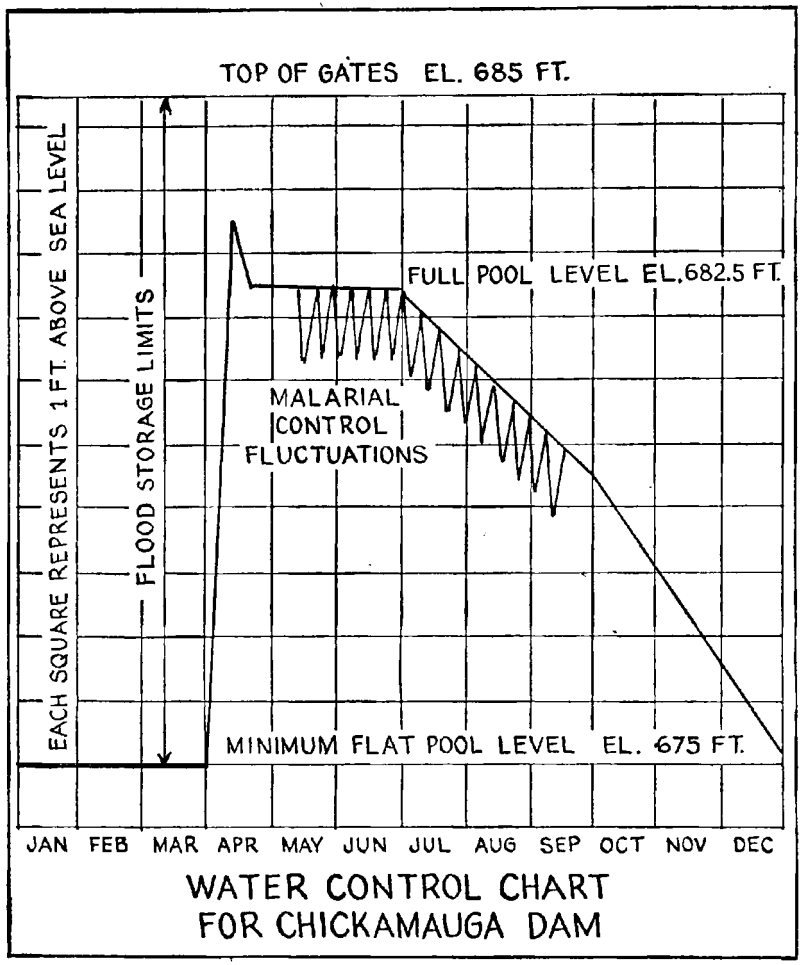
construction, and operation of this complex, multipurpose hydrologic system is without precedent. The engineers of the Tennessee Valley Authority have given the world a model of resource development, a blueprint demonstrating that the Big Wheel can be brought into balance and the Little Wheel run for the benefit of mankind.

The level of the water in those twenty-eight reservoirs is the vital concern of the TVA's Water-Control Planning Division. From its headquarters in Knoxville the division operates this far-flung system as a single unit. Its first consideration, leaving aside special flood conditions, is to prepare the reservoirs for



the seasonal fluctuations in the flow of water and to equalize its distribution the whole length of the river. Under average conditions, as directed by the Water-Control Planning Division, the water in each reservoir must be regulated to specified levels during each month of the year. Besides these broad seasonal adjustments there are the daily requirements of maintaining channel depth, regulating electric-power production, and malaria control.

If you lived in a cottage near the shoreline of the Chickamauga lake, during the late fall you would notice that the water was beginning to recede; by Christmas time wide mudflats



WATER CONTROL CHART
FOR CHICKAMAUGA DAM

would show here and there. This drawdown is in preparation for the winter rains, and if possible this minimum level is held until late in March. Then the water starts to rise again, and by the time the trees are green and the fish are beginning to bite, the lake is full. With the coming of warm weather, but before the first mosquito has hatched, each week the lake is suddenly lowered a foot one day and raised a foot the next. Though annoying to fishermen, this rise and fall continues once a week throughout the summer.

The month-by-month water levels at Hiwassee or Chatuge make a somewhat different pattern on the seasonal chart, usually rising earlier in the year and holding the high water level as long as possible to offset the dry months of fall. From the Knoxville headquarters the division is in direct contact with the twenty-eight reservoirs, either by telephone or teletype. Also, there are automatic electric machines, set far up on the mountain brooks and streams, that flash their messages to headquarters, indicating any fluctuation in stream flow.

The following description may give some idea of how the Water-Control Planning Division works when the Valley is threatened by flood:

At 8:00 a.m. the teletypewriter begins clicking. The preliminary weather forecast from the U.S. Weather bureau comes in. Under a cooperative agreement the TVA is furnished with three special complete forecasts daily. These include the general state of the weather, the amounts of rainfall expected in the forecast period, and its distribution over the Valley. Also, there are specific forecasts for thirty-six hours in advance and a general outlook for three additional days.

At 8:15 a.m. the teletypewriter begins again. Hourly data covering the operations of each TVA dam for the past twelve hours is received at Chattanooga—elevations, discharges, rainfall. From the teletype sheet this is transcribed to forms for immediate use as well as permanent record.

Three telephones begin ringing at the same time. Long-distance calls come in from nine TVA offices geographically spread about the Valley, which serve as collecting centers. Each reports the rainfall and river stages for the stations in its area. This data is tabulated. River stages are converted into discharge. Rainfall reports are entered on a special map, which becomes pockmarked as more and more information is recorded. Each spot represents a rainfall gauge or a river gauge from which reports have been made.

At 9:15 a.m. preliminary estimates of TVA's expected operation at Kentucky Dam are sent to the Corps of Engineers at Cincinnati and the U.S. Weather Bureau at Cairo. From them observed stages on the lower Ohio and Mississippi are received.

This is the beginning of a flood period and preliminary increases in discharge must be started. The Chief System Operator flashes out orders. Increase discharge at Watts Bar 20,000 (cubic feet per second), Chickamauga 20,000, Guntersville and Wheeler 25,000, and Pickwick and Kentucky 40,000. If tributary reservoirs are spilling water their releases are reduced. On the same call the expected power generation at each dam is obtained, to be used in routing flows through the system.

Meanwhile the incoming data are being analyzed. Engineers estimate the inflows to each reservoir.

Tributary releases are set and the estimated inflows to each of the main river reservoirs are assembled on one form. On the basis of these flows and the outlook for additional rain, a decision is reached on how much storage space will be needed. Chattanooga may be put to about flood stage to reserve space in the reservoirs for additional rain.

Again the Chief System Operator's office is called. Additional instructions in flood-gate changes are given.

Predictions of river stages at principal points in the Valley are made. Warnings are sent out by radio. Final data on TVA operations go to Cincinnati and Cairo. It is now 1 p.m.

Every six hours a rainfall report is received from all TVA dams. New maps are plotted, flows recomputed, and the operation changed if necessary. At 8:00 p.m. revised flood warnings are issued.

In the meantime other calls are coming in from persons the flood is affecting.

Industries at Chattanooga are asking how long they will have to remove pumps and equipment. A tow approaching one

of the locks can get through with the existing discharge but not with any increase. Can the increase be delayed an hour?

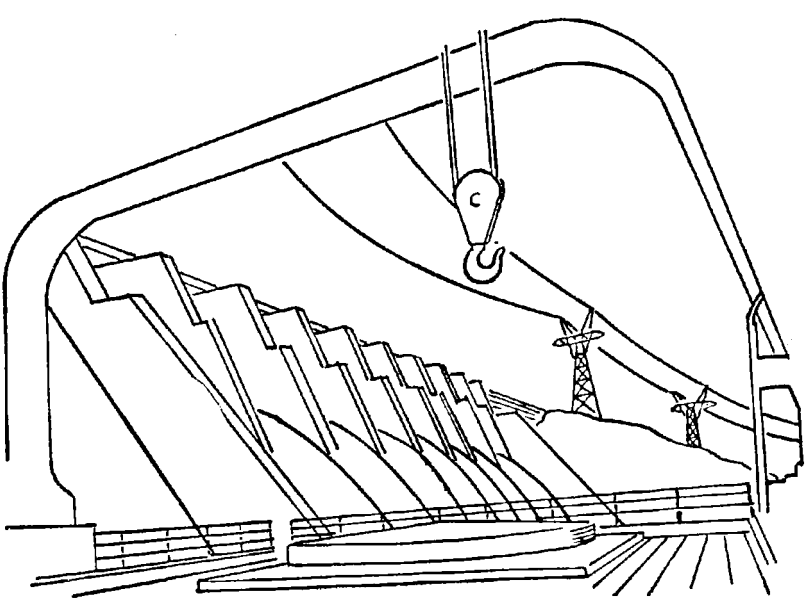
The Red Cross is evacuating families in the lower Sequatchie Valley. How much higher will the water go?

A farmer below Guntersville Dam has fifty pigs on an island. Another foot rise will drown them. Can further increases be stopped until they are removed?

A cotton warehouse at Florence needs additional time for sandbagging before further increases are made.

At intervals the sequence starts again, and after the crest has passed Chattanooga the stage begins to drop. Gate discharge is started at the tributary reservoirs to draw out excess water stored during the flood.

The flood wave passes downstream. The Ohio is rising and Cairo stage reaches 40 feet. Kentucky drawdown is started. Gradually flows recede, the excess flood water has passed on into the Ohio. The system is back to normal and ready for the next flood.



Land

"Over the past twenty years great progress has been made in protecting the watershed through improved agricultural practices in the Valley, in shifting toward a cover crop and livestock system of farming, and in building up the soil through the use of soil minerals. Reforestation has progressed, protection against fire in the forests that cover half the Valley has been greatly extended. A start has been made toward placing Valley forests and woodland on a sustained yield basis.

"A striking change has taken place in the agricultural picture in the Tennessee Valley since 1933. The basic fact is a reversal of a long-term trend of erosion and soil depletion, which nineteen years ago was well advanced.

"Today the soils and the agricultural systems are observedly on the upgrade. The scars of erosion are being healed by the close-growing legume and forage crops and by reforestation. Phosphate and lime, most of it produced commercially, are being used in increasing quantities to promote soil and water-conserving cover. A million acres of land has been terraced, another million acres has been shifted from row to close-growing crops, and improved permanent pastures have been increased by 800,000 acres. More forage and pasture have increased the number of livestock and encouraged dairying. More diversified farming is making possible more efficient use of farm labor. Most of the farms in the Valley now have electricity.

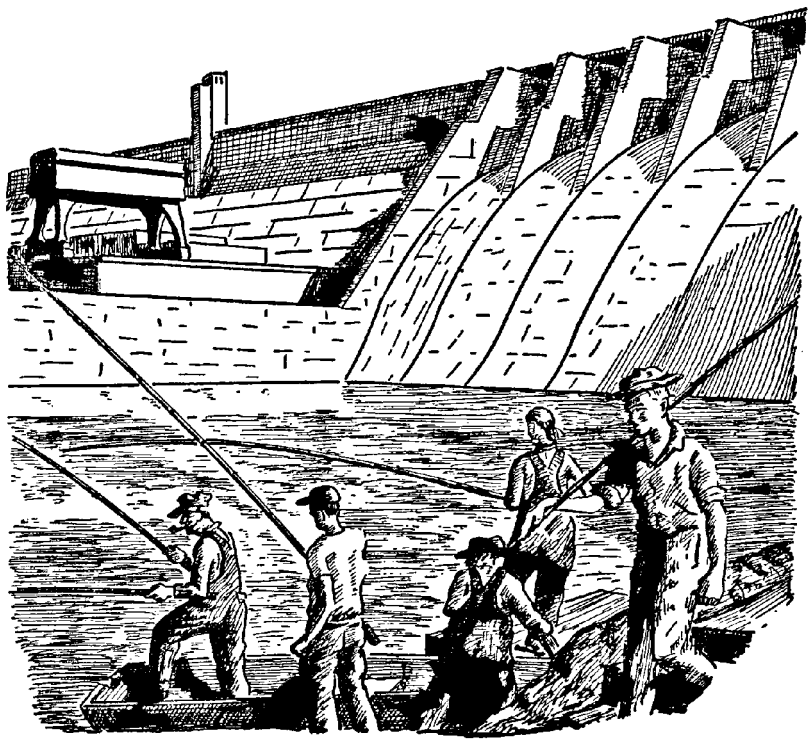
"The region today is much more capable of producing food and fiber than it was before the war. But it is far from the level of fertility and productiveness justified by its soil base, its favorable growing climate, its ample rainfall, its growing scientific and technical knowledge, the energy and initiative of its people, and their basic love of the land." [1]

[1] TVA Annual Report, 1951.

As indicated in the above TVA report, no one knows better than the Tennessee Valley Authority the amount of "unfinished business" that is left to do on the land. Although the downward spiral has been checked, the conservation of the natural resources of the land is still at the mercy of the Big Wheel (hydrologic cycle). This has led to two extreme points of view that need correction: first, that major floods would not occur if the land were uniformly protected by grass and forest cover; and second, that mud and silt will fill the reservoirs in the next quarter of a century.

As to the first misconception, it should be pointed out that if any part of the annual 150 billion tons of rain that fall on the Valley is sufficiently concentrated in time and place, there will be a flood. It is true that the land damage to heavily forested hillsides will be at a minimum, but once the forest floor becomes completely saturated with water, from there on the runoff will nearly equal the rainfall. Reforestation, permanent pasture, terracing, and contour plowing will help to reduce flash floods, but these measures would not have stopped the destruction of 1867, and no matter how far extended they cannot replace the existing flood-control system. However, after careful research, it does appear that these measures on the land will reduce to a negligible amount the mud and silt deposits in the reservoirs.

Two out of every three families within the Valley make their living from the land. The farms are small but the families are large, and there are still far too few industries within the region to bring the land-man relationship into balance. This faulty distribution tends to slow the Little Wheel, with the result that the per capita income of the Valley remains at only 60 per cent of the national average. Even so the living standards have risen, and if the method of comparison is based upon the increase in the use of electricity, the material change has been enormous. But to describe this region as a garden spot or a



perfect model for rural living would be unfair. These modest little farms, with their new bungalows and unpainted barns and outbuildings, have none of the picturesque quaintness of New England, none of the Victorian opulence of Pennsylvania or Ohio. The success of the TVA's program of reconstruction on the land can be judged only in terms of the Valley itself.

In listing the accomplishments of the years since 1933, one might get the impression that TVA was a stern taskmaster—all work and no play. Again this would be incomplete, for the Authority has brought new possibilities for recreation to the people of the Valley. "The same dams that hold back floods, provide electric power, and make an artery of commerce have brought countless hours of pleasure each year to the thousands

of fishermen, swimmers, boaters, campers, and just plain idlers who know the value of leaving the cares of the world behind. The fishermen above all have found new pleasure on the TVA lakes. There was great fear when TVA first started building dams that the new environment would be fatal to the fish. The fears proved groundless. Several seasons of research by TVA fisheries experts showed that, instead of declining, the fish population was multiplying so rapidly that stocking was unnecessary and the traditional closed season was eliminated." [2]

Now that we are on the subject of fishermen, let us go back to those two fishermen from Decatur, Alabama, Jake and Sut. You remember how they felt about the TVA on that spring morning in 1933. As Sut said, their little river town of 25,000 was "smack on the bottom"—flat broke. In 1950 Barrett Shelton, the editor of Decatur's leading paper, had this to say:

"In the beginning I opposed TVA. I did not know what it intended. I knew I wanted no government control over my life, nor over the lives of my people.

"Our townspeople needed jobs, our farm people needed month-by-month payrolls, rather than a once-a-year income secured from the harvesting of one crop—cotton.

"Today Decatur has a market for corn, wheat, livestock, milk, timber, small grains, and truck crops—as well as cotton. Fifteen years ago we were dozing in the sunshine, waiting for that once-a-year payroll brought by cotton and wearing out our second-finest resource, the land. Today the cash income from all farm products in the area surrounding Decatur is forty-three million dollars. Land building did it. Flood control did it. Navigation did it. Malaria control did it. TVA, with the other state and federal agricultural and health agencies, their teachings activated by an intelligent and determined people, did it.

"Let's stop here for an illustration of the value of malaria

[2] TVA Annual Report, 1951.

control. Did you ever have malaria? I have, the majority of my people have. Do you know what you want to do when you have malaria? Nothing. You want to prop your feet on the desk, or if you are not an office man, perhaps you'll take a day or two off from your job in industry or take out of the fields just to get a rest. Malaria is restful—and nonproductive. Soon after the creation of TVA a nationally known manufacturer bought a bankrupt hosiery plant in our community. The new company introduced physical examinations for all employees and found that every third one had malaria. Ten years later, after the malaria-control program had been in action, the figure dropped below 1 per cent. Today, because malaria is completely controlled, this firm does not require the malaria test. And what happened to the people in that plant? Why, they outproduced the employees of three other plants of this same company. That is how government can be helpful to people by making it possible for them to help themselves."

The average visitor motoring through the Valley might not be impressed by these changes, if he noticed them at all. In one day an active sightseer can visit the Fontana, Douglas, and Cherokee Dams, and such an experience might give him a fair idea of how the TVA controls the flow of water in the Valley. As architectural structures, these dams immediately convey, through their clean strength and beauty, the function and purpose for which they were built. On the other hand, a terraced sloping meadow can hide under its green grass cover the red scalds and gullies that had stripped it of all usefulness only a few years before.

The land hides its secrets, and to determine the presence or absence of that vital 5 per cent mineral content requires an expert eye. But the colors of the Valley landscape are changing —the dull grays and browns that were cut by the slashes of red are disappearing, and the new greens are rich and lustrous.

Communities

The mountains seemed to close in on the little valley, and with every mile the road grew worse and worse. As the car crept around the blind, hairpin curves, the four occupants clung to their seats, each praying to himself that nothing was coming in the opposite direction. The wide shallow stream, just below, followed each twist and turn, until, without warning, the road dipped down and the tracks disappeared in the swiftly running water among the cobbles and stones that formed the creek's bed. As the driver hesitated before plunging the car across, a man with a gun followed by two hound dogs stepped out from the bushes on the opposite bank.

"Is this the way to the Lick Leg Elf community?" called the driver.

The dogs started to bark, and the tall unkempt figure across the stream shifted the gun into the crook of his arm. From

under his big black hat long hair hung down over his shirt collar, and a heavy dark beard covered the lower part of his face. He stood silently, glaring at the car, while the two hounds yelped and bayed at the water's edge.

"Whar ye be agoin'?" asked the man with the gun.

"We're on our way to the Lick Leg Elf community's barbecue. Guess we've lost our way," answered the driver. Then, as the man showed no intention of answering, the driver asked, "Isn't this the Fox Hollow Road?"

"Fer them that knows it," answered the dark figure, striding toward them across the creek bed. "We ain't much of a mind fer strangers in these parts. Ye better be turnin' back—the hull lot of ye."

After a whispered conference the startled occupants of the car decided it was best to go back five miles to the crossroads store. As they started to back the car into a little clearing near the stream the man walked up to the side of the car.

"Lordy, Mr. Evarts, I never thought I could fool you that easy!" The man laughed as he whipped off his big hat, and with it came the long hair and the black beard, revealing an elderly man, clean shaven, with a bald head.

"Why, Jim Dabney! You old rascal! Is that the way you greet your friends up here?" cried Mr. Evarts as he pushed forward from the back seat to shake hands.

"That's the way it used to be around here. I'm the official welcoming committee from the Lick Leg Elf Community Association," said Jim Dabney as he pulled a huge gilded wooden key from the front of his overalls and handed it to Mr. Evarts. "You are all welcome. The barbecue is ready, and the folks are waiting for you just a step up the lane. I'll show you the way."

All the friendly jokes and legends about "hillbillys," their music and their independent way, have built up a kind of cartoon caricature that stands as a symbol for the Southern mountaineer. Just as the gentleman with the pipe, Sherlock

Holmes cap and monocle, is accepted by us as the symbol for all Englishmen, so the tall, thin, barefooted figure with the long beard and a single gallus now represents all the inhabitants of the Southern Appalachians. The moonshiner and the rural yokel have become standard brands on the radio and in the comic strip. All of this may be entirely justifiable as humor, but, if mistaken for reality, may lead to malicious prejudice.

The old songs and music, the folk dances and crafts, that have been handed down without change and with loving care from generation to generation have built up a strong and pure tradition cherished and respected by the people of the Tennessee Valley. But this does not mean that they prefer to remain just picturesque highland folk, left behind to doze on the front stoop with the pigs and chickens. Today a man like Jim Dabney can make fun of the old-time customs and habits, for he knows that the fears and suspicions that led his forebears to consider the man from the next county a "furriner" no longer exist. Too often the mountaineer's independence was only another word for isolation, and his resourcefulness only the exploitation of the natural bounty of the wilderness. However, the recent years have clearly demonstrated that the people living within the Valley are eager to accept both the benefits and the responsibilities of our modern world.

As you know, the TVA, in order to start its program of reconstruction on the land, put three tangible tools at the disposal of the Valley people: fertilizer, free seedlings, and cheap electric power. There was one other tool, and it was intangible, just an idea, and would have to be fashioned entirely by the people themselves. This was the development of cooperative community action. Through organizations like the Meyer's Creek or Peckerwood Community Association, farmers combined their efforts to carry out practical programs that would benefit each of them individually as well as help the community. This formed the last rung on the test-demonstration

ladder (see page 153). Through these local organizations farmers were able to purchase and share the use of farm machinery and equipment that would have been too expensive for them to have owned individually. They learned to buy seed, fertilizer, and feed on a cooperative basis. Later they built storage and processing plants as an aid to marketing farm produce. The community needs of education and health became their responsibility.

George Medford knew that life on his mountain farm had changed. If he could not say just when it happened, he certainly could not tell what caused it. Was it the war? Was it the Farm Extension Service in the form of Ken Roberts' help and advice? Was it the Peckerwood Community Association? Or was it the Tennessee Valley Authority? George would probably doubt that these last two had much to do with it. The TVA "was some kind of a guvment agency that was always fightin' floods and owned the Chatuge lake"; and as for the association, it was only "jist startin'." But he would admit that "if it hadn't bin for Ken Roberts, I'd still be scratchin' around on them li'l cornlots, makin' fifteen bushels to the acre."

From the Authority's point of view, this is as it should be. For one of its basic principles has been "to cooperate with the people of the Valley through their state and local governments, their institutions, and their organizations both public and private, and with other federal agencies dealing with natural resources." The TVA points to this cooperation as being an important factor in contributing to the success of the over-all program. At the start the TVA made financial and technical contributions to the seven Farm Extension Service branches in the Valley. Today, those state and local agencies have expanded to the point that they can now lead the way toward the further development of the natural and human resources in the Tennessee Valley.

XIV: Questions for Today and Tomorrow

OUR intention was to take in the whole view, and, like most amateur photographers, on thumbing through the newly developed prints we find them disappointingly inadequate. The focus was changed to include a long shot of Colonel John Donelson, then came a whole series on Muscle Shoals, followed by a panorama of the Chickamauga Dam and the Hiwassee watershed, as well as three close-ups of the Medford family. As a record of what has happened to the water and people of the Tennessee Valley, these snapshots seem very incomplete. Perhaps the subject matter was too difficult, for both water and people are constantly moving, constantly changing.

The TVA can supply the complete record for those who wish to study it. It is enough if this outline can convey some sense of the importance and significance of the vital economic and social experiments that are being carried out in the Valley today. The federal government has undertaken the planning and development of the natural and human resources within one river basin. We were a pioneer country only a short time ago, and any such expedition by our government into the comparatively unknown realm of planning "for the economic and social well-being of the people" brings up many questions. Let us be content with four: two for today and two for tomorrow.

1. Could private enterprise and the seven individual states have carried out such a program? It seems unlikely. A watershed cuts across state boundaries, and though the brooks and streams and rivers all run in one direction their control is arbitrarily divided at the state line. If each of the seven states has its own control over the Little Wheel, then there is small chance of bringing the Big Wheel into balance. The development of the resources within a watershed requires an authority capable of planning and executing an integrated program for that region as a whole. Private enterprise might have turned the hydroelectric possibilities of the Tennessee River into profits, but it could never have afforded the added expense of a navigable channel or a flood-control system.

2. Do the people of the Valley stand behind the TVA? The people know that they are part of TVA and understand that it belongs to them. Woe betide the politician that attempts to take it away from them!

3. Can the TVA be used as model for the conservation and development of resources elsewhere in the United States? The technical and engineering data acquired in the building of the TVA river system have played a part in the planning of the Colorado and Columbia Rivers. One must bear in mind that the other great rivers, the Missouri, the upper Mississippi,

the Arkansas, are vast in extent and that there are varying and complex problems in the basins through which these rivers flow. The engineering blueprint has to be redrawn for each situation. Also, until the people living within these watersheds are awakened to the need of joining with the federal government in conserving the natural resources of their own region, little can be done. Perhaps the great Missouri floods in the summer of 1951 and the spring of 1952 will hasten this process.

4. Can the experience of the TVA in coordinating the activities of the seven states be applied internationally to other river basins? Gordon R. Clapp, present chairman of the Board of TVA, answered this at a UN conference in 1949: "I do think that the experience of the Tennessee Valley Authority in looking at water resources as a whole, and in following water where it flows to assess its potential assets without regard to man-made boundaries, is an approach which in other river valleys will produce or create values which otherwise would be lost if those water resources were looked at piece by piece in unrelated parts. I think, too, that in the experience of the Tennessee Valley in relating water to land and in relating both to the greatest possible benefit that can come to human living, there is certainly something which can be applied in the approach that is made to resource development in other river valleys of the world."

The physical plant of the Tennessee Valley Authority for regulating the Tennessee river system is now practically complete. At each of the dams there is a visitors' gallery from which one can look down on the huge circular generators, humming quietly as they efficiently change the energy of falling water into electric power. Engraved above there is always the same message: *Built for the People of the United States.*